FIG. 1

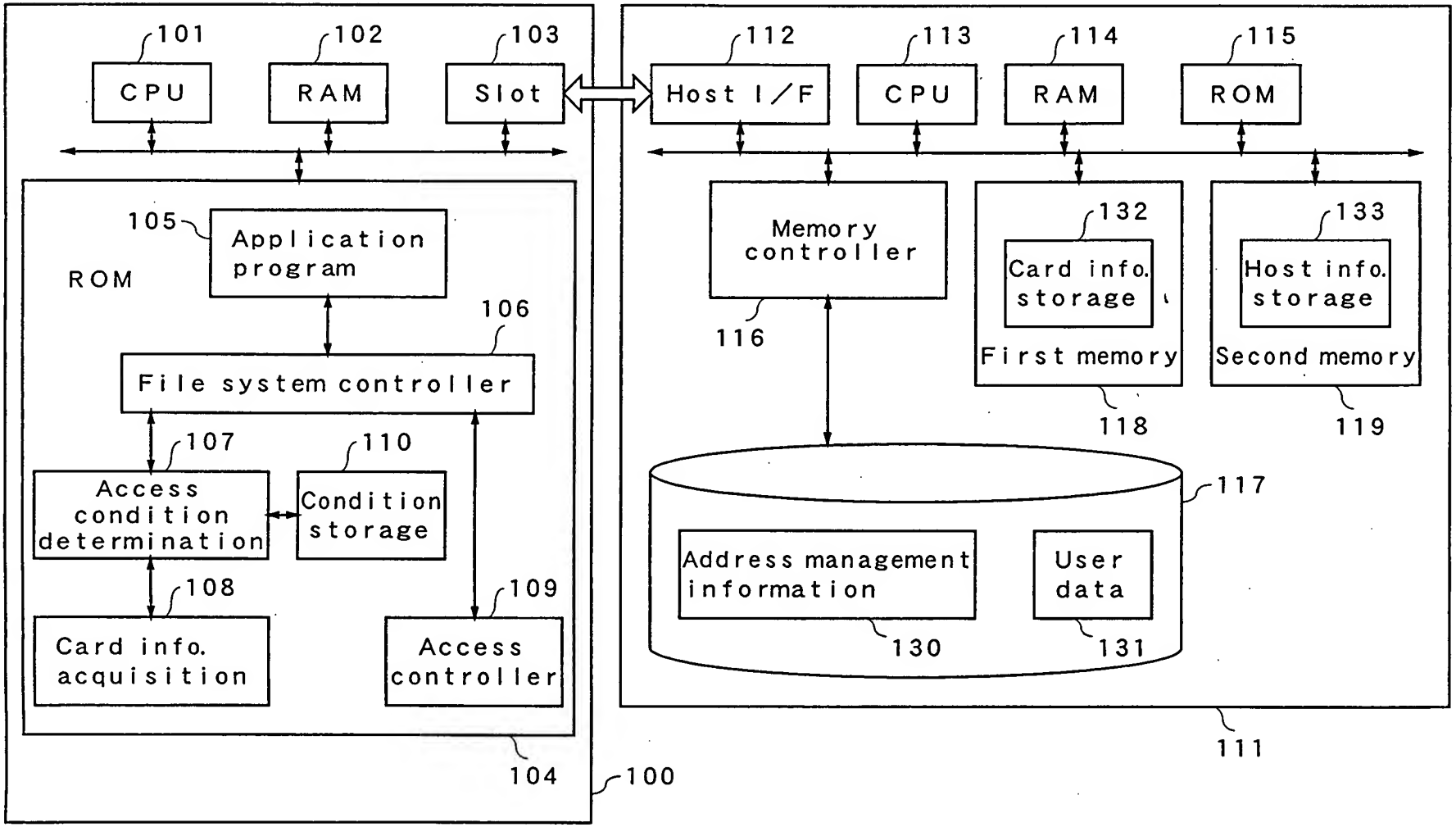

101
CPU
102
RAM
103
Slot
105
Application program
ROM
106
File system controller
107
Access condition determination
110
Condition storage
108
Card info. acquisition
109
Access controller
104
100
112
Host I/F
113
CPU
114
RAM
115
ROM
Memory controller
116
132
Card info. storage
First memory
118
133
Host info. storage
Second memory
119
117
Address management information
130
User data
131
111

FIG. 2

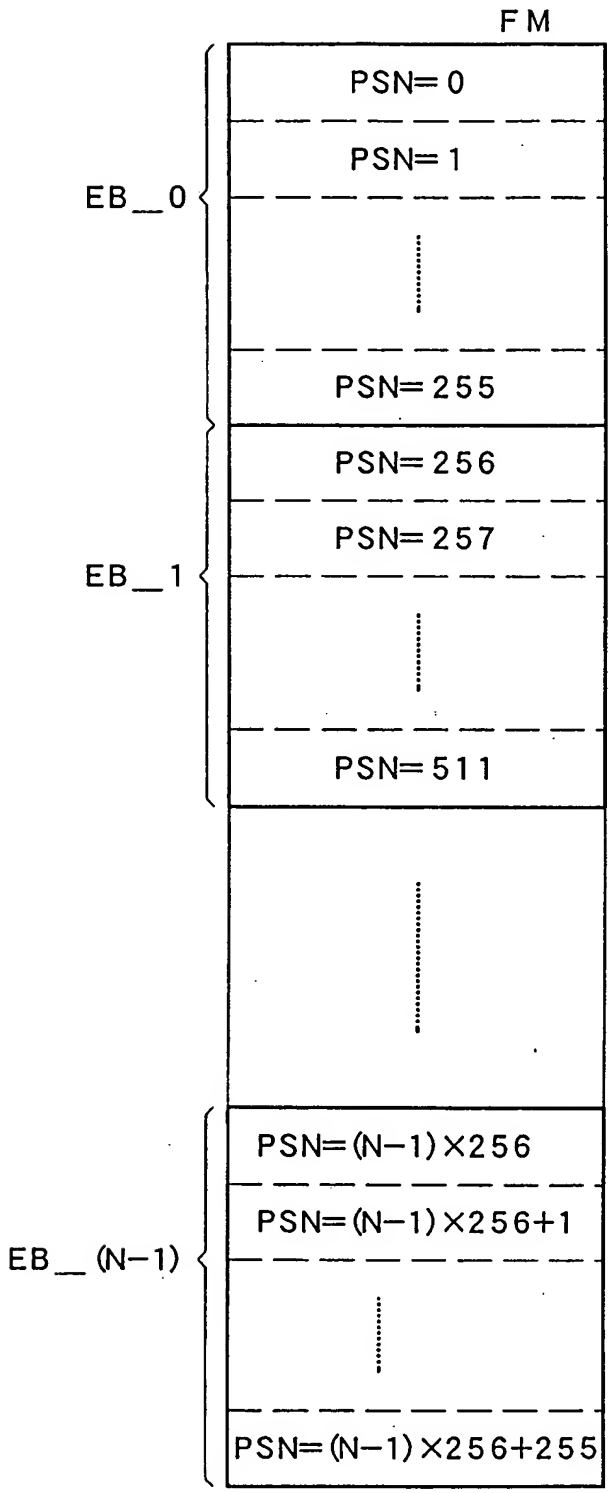

FM
PSN=0
PSN=1
EB_0
PSN=255
PSN=256
PSN=257
EB_1
PSN=511
PSN=(N-1)×256
PSN=(N-1)×256+1
EB_(N-1)
PSN=(N-1)×256+255

FIG. 3

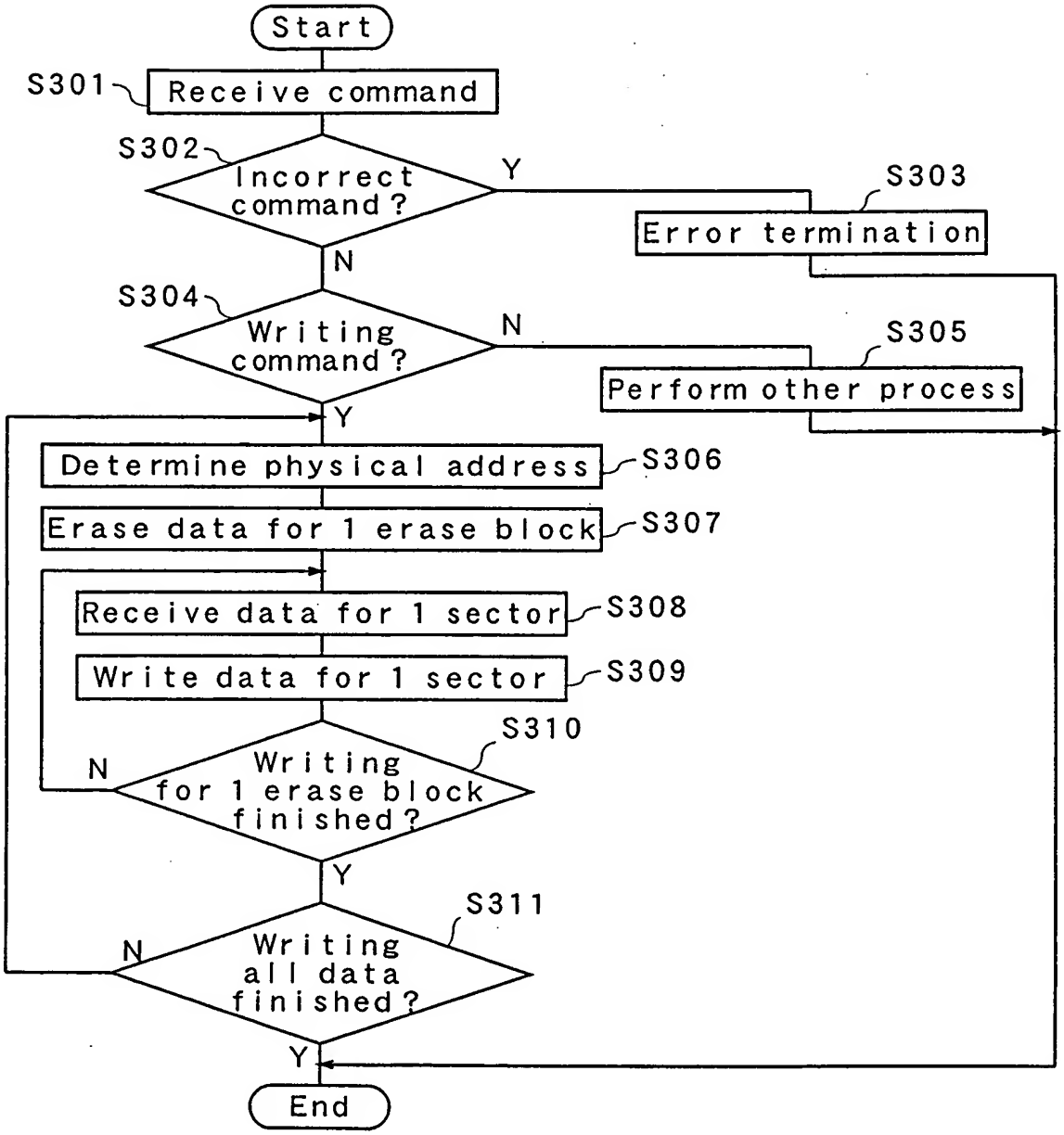

Start
S301
Receive command
S302
Incorrect command?
Y
S303
Error termination
N
S304
Writing command?
N
S305
Perform other process
Y
Determine physical address
S306
Erase data for 1 erase block
S307
Receive data for 1 sector
S308
Write data for 1 sector
S309
S310
N
Writing for 1 erase block finished?
Y
S311
N
Writing all data finished?
Y
End

FIG. 4

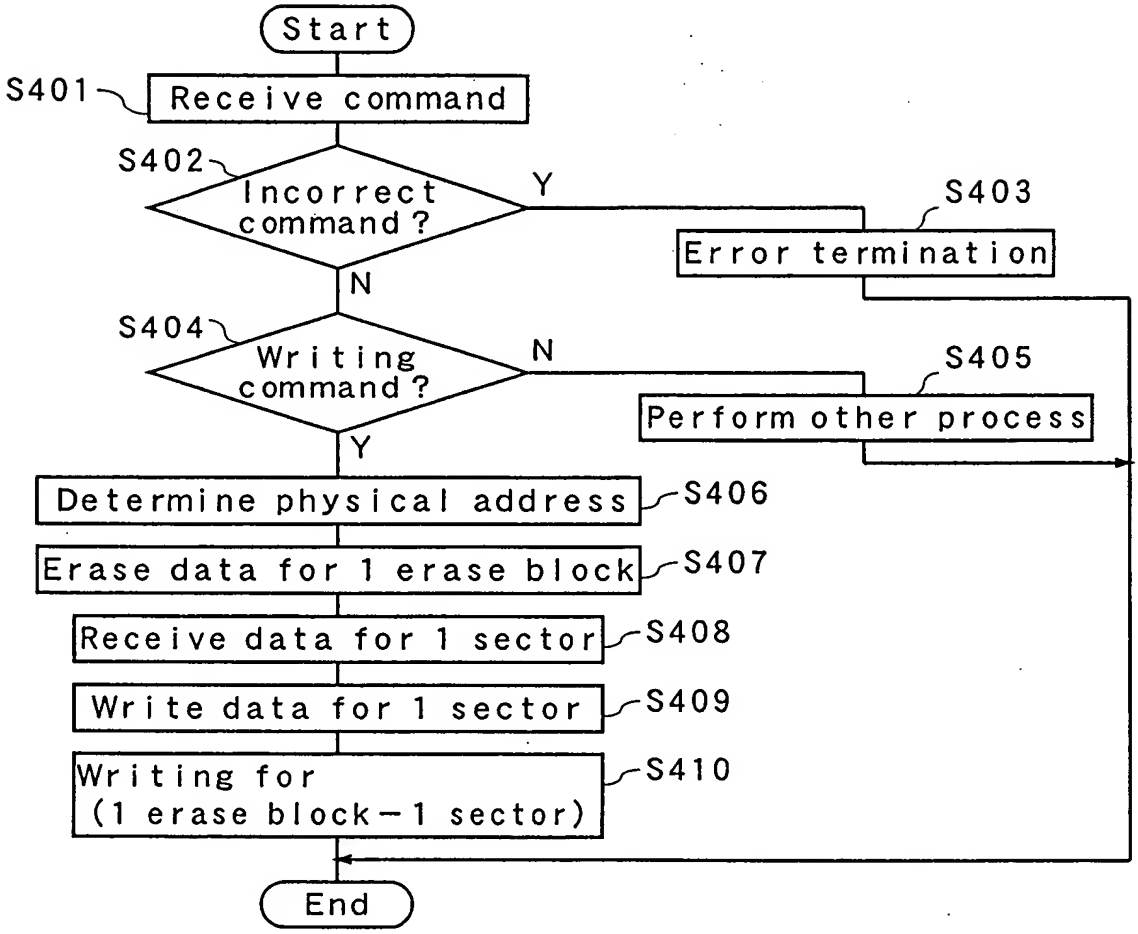

Start
S401
Receive command
S402
Incorrect command ?
Y
S403
Error termination
N
S404
Writing command ?
N
S405
Perform other process
Y
Determine physical address
S406
Erase data for 1 erase block
S407
Receive data for 1 sector
S408
Write data for 1 sector
S409
Writing for (1 erase block−1 sector)
S410
End

FIG. 5

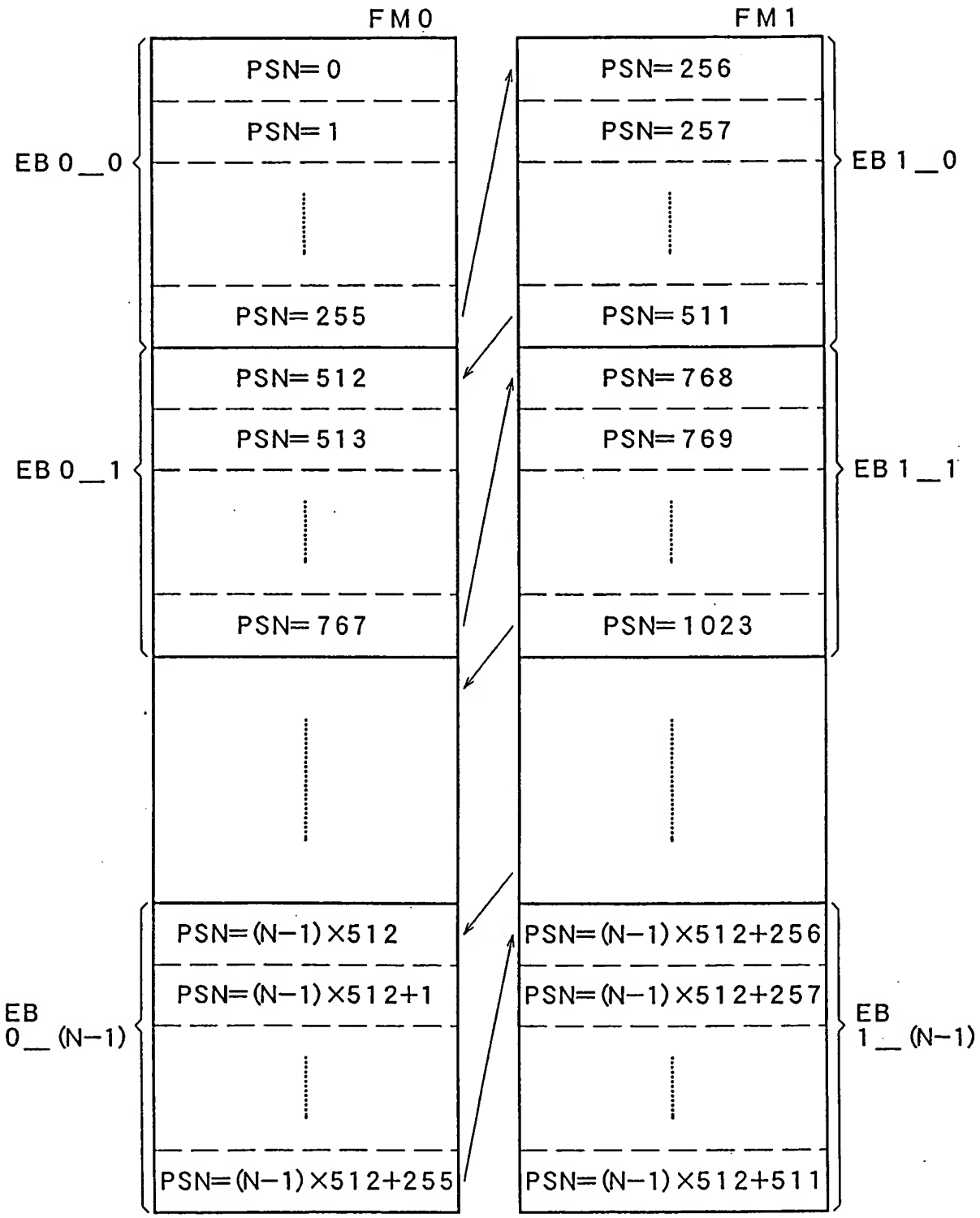

FM0
FM1
PSN=0
PSN=1
PSN=255
PSN=256
PSN=257
PSN=511
EB0_0
EB1_0
PSN=512
PSN=513
PSN=767
PSN=768
PSN=769
PSN=1023
EB0_1
EB1_1
PSN=(N-1)×512
PSN=(N-1)×512+1
PSN=(N-1)×512+255
PSN=(N-1)×512+256
PSN=(N-1)×512+257
PSN=(N-1)×512+511
EB 0_(N-1)
EB 1_(N-1)

FIG. 6

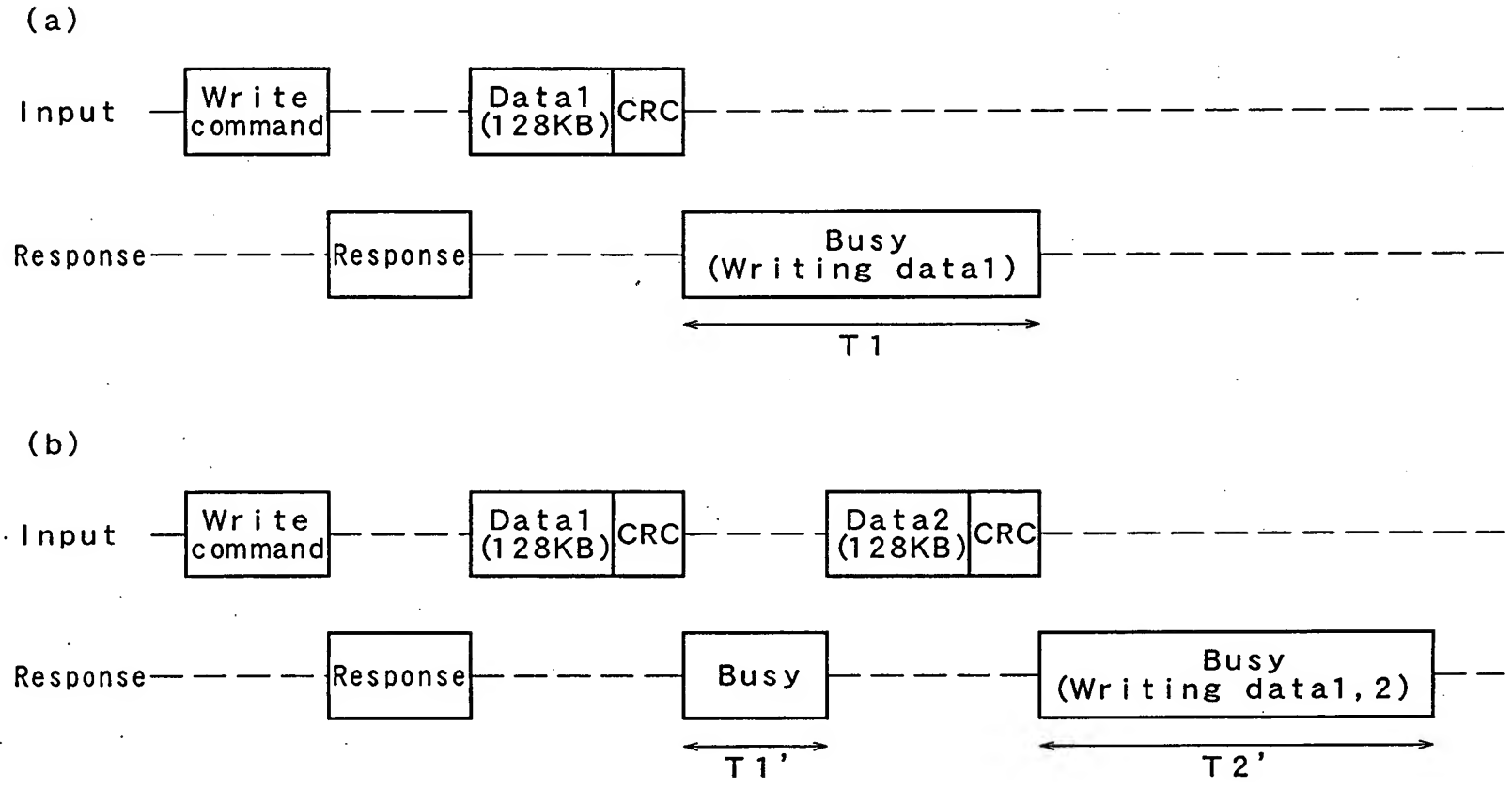

(a)
Input
Write command
Data1 (128KB)
CRC
Response
Response
Busy (Writing data1)
T1
(b)
Input
Write command
Data1 (128KB)
CRC
Data2 (128KB)
CRC
Response
Response
Busy
Busy (Writing data1, 2)
T1'
T2'

FIG. 7

Types	Items
First info.	Memory type
	The number of memories
	Management method of memory
	Erase block size
	Management block size
	Temperature condition
	Power consumption
	Current value
	Voltage value
	Card type
Second info.	Process type
	Process unit size
	Process unit boundary
	Process unit time
	Access method
	Min. sequential area at S.A.
	Input clock frequency
	Bit width
Third info.	Rate performance level
	Data size/Unit time
	Process time/Unit size
	Transfer rate
	Process time inside card
Fourth info.	Error occurrence probability
	Worst value of error notification time
Fifth info.	Rate performance level determination ref.
	Rate performance level
	Power consumption level

FIG. 8

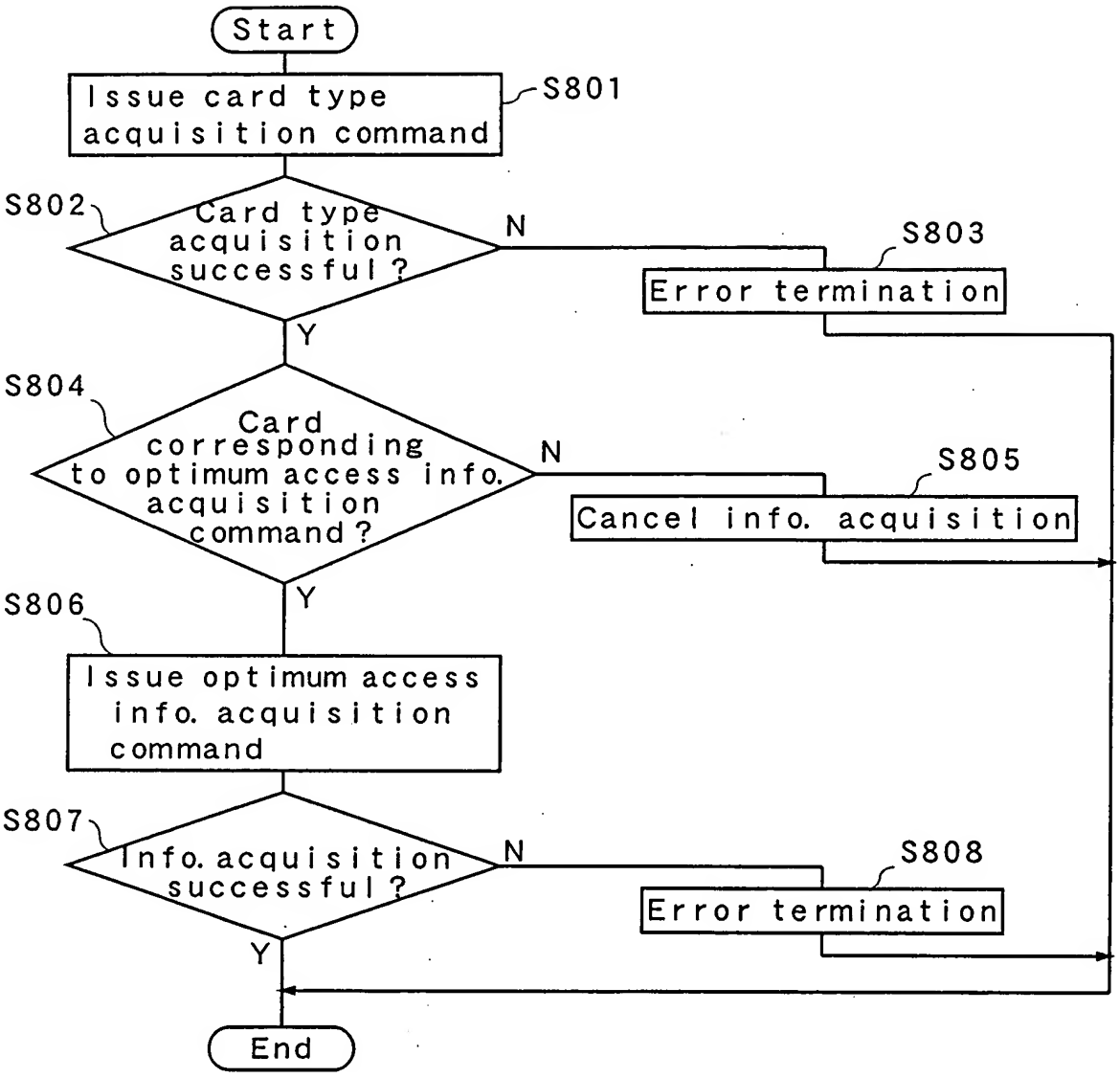

Start
Issue card type acquisition command
S801
S802
Card type acquisition successful?
N
S803
Error termination
Y
S804
Card corresponding to optimum access info. acquisition command?
N
S805
Cancel info. acquisition
Y
S806
Issue optimum access info. acquisition command
S807
Info. acquisition successful?
N
S808
Error termination
Y
End

FIG. 9

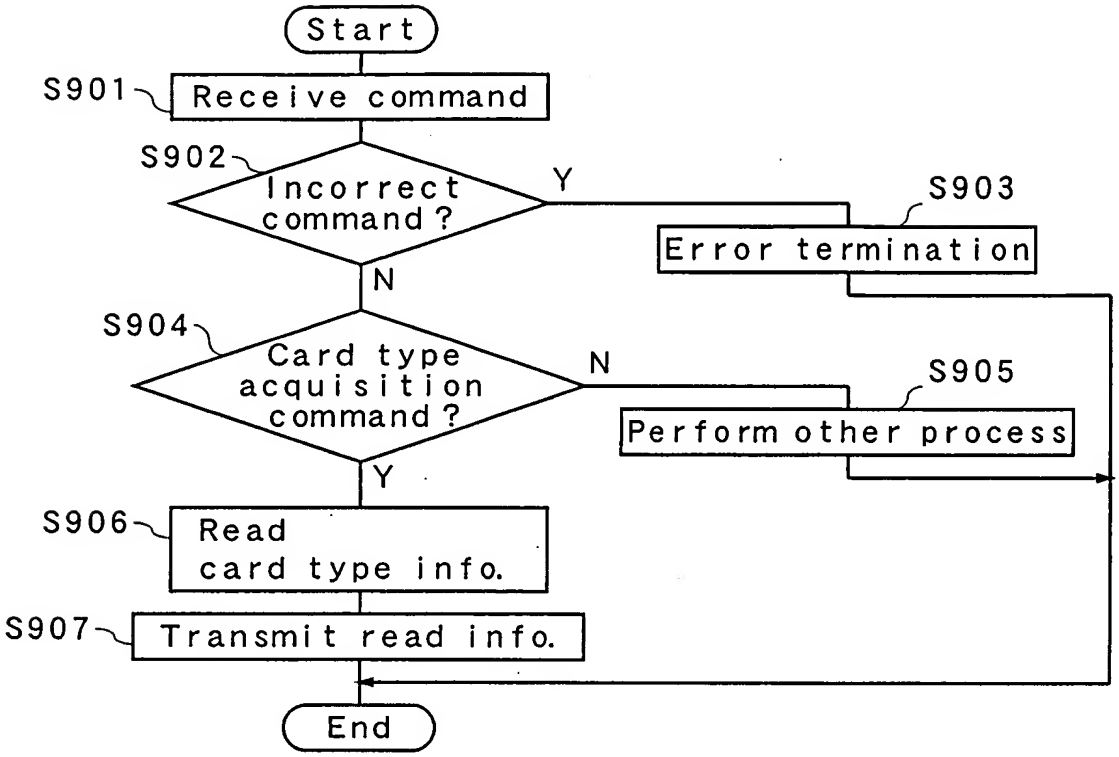

Start
S901
Receive command
S902
Incorrect command ?
Y
S903
Error termination
N
S904
Card type acquisition command ?
N
S905
Perform other process
Y
S906
Read card type info.
S907
Transmit read info.
End

FIG. 10

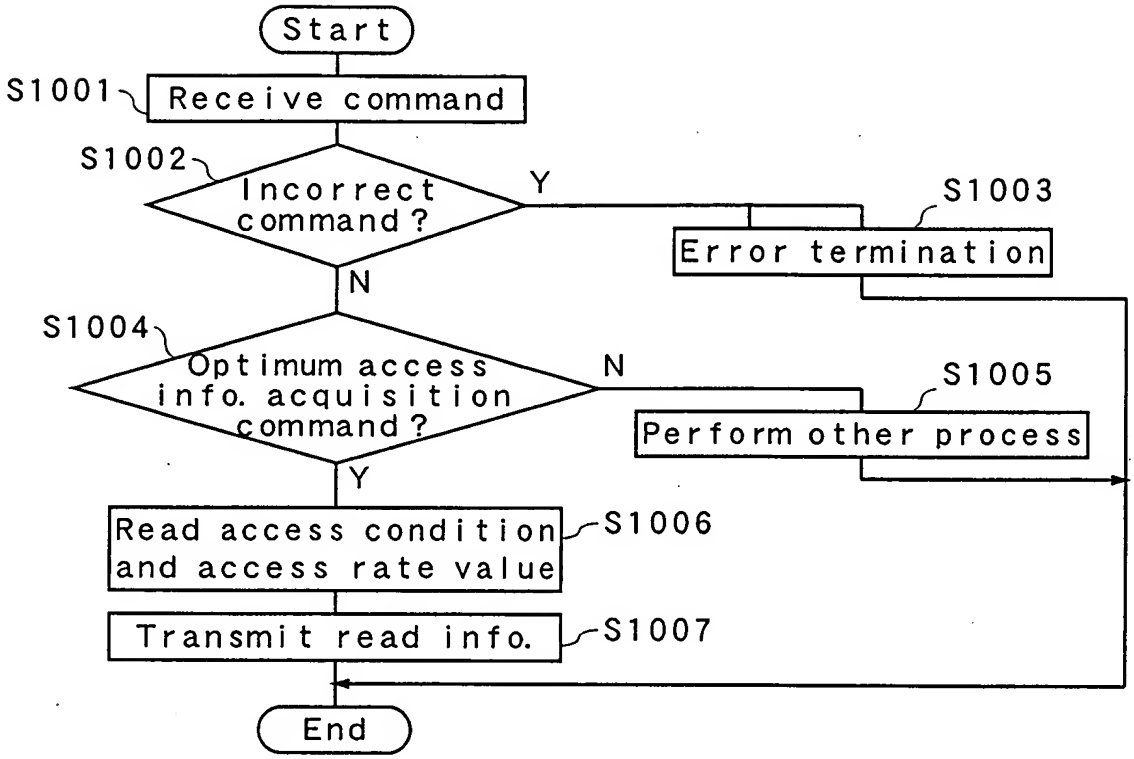

Start
S1001
Receive command
S1002
Incorrect command?
Y
S1003
Error termination
N
S1004
Optimum access info. acquisition command?
N
S1005
Perform other process
Y
Read access condition and access rate value
S1006
Transmit read info.
S1007
End

FIG. 11

(a)

Items	Condition values
Process unit size	Multiple length of 128KB
Process unit boundary	Multiple length of 128KB
Access method	Sequentially accessing to sequential area having 256KB over
Input clock frequency	25MHz over
Bit width	4 bits

(b)

Transfer rate of reading(standard)=11MB/s
Transfer rate of writing(standard)=10MB/s
Transfer rate of erasing(standard)=10.3MB/s
Transfer rate of reading(worst) =6MB/s
Transfer rate of writing(worst) =5MB/s
Transfer rate of erasing(worst) =5.1MB/s

FIG. 12

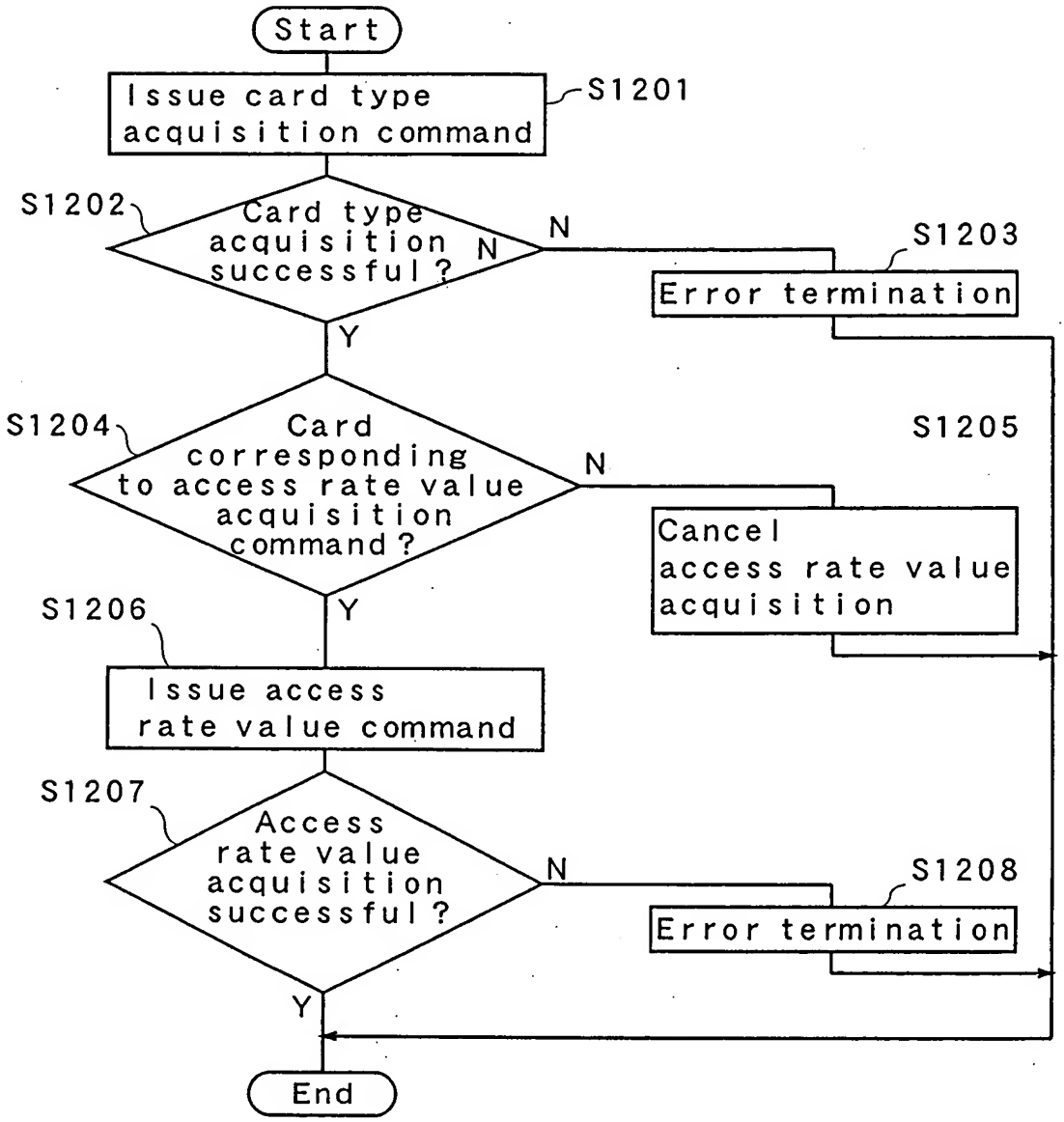

Start
Issue card type acquisition command
S1201
S1202
Card type acquisition successful?
N
N
S1203
Error termination
Y
S1204
Card corresponding to access rate value acquisition command?
N
S1205
Cancel access rate value acquisition
Y
S1206
Issue access rate value command
S1207
Access rate value acquisition successful?
N
S1208
Error termination
Y
End

FIG. 13

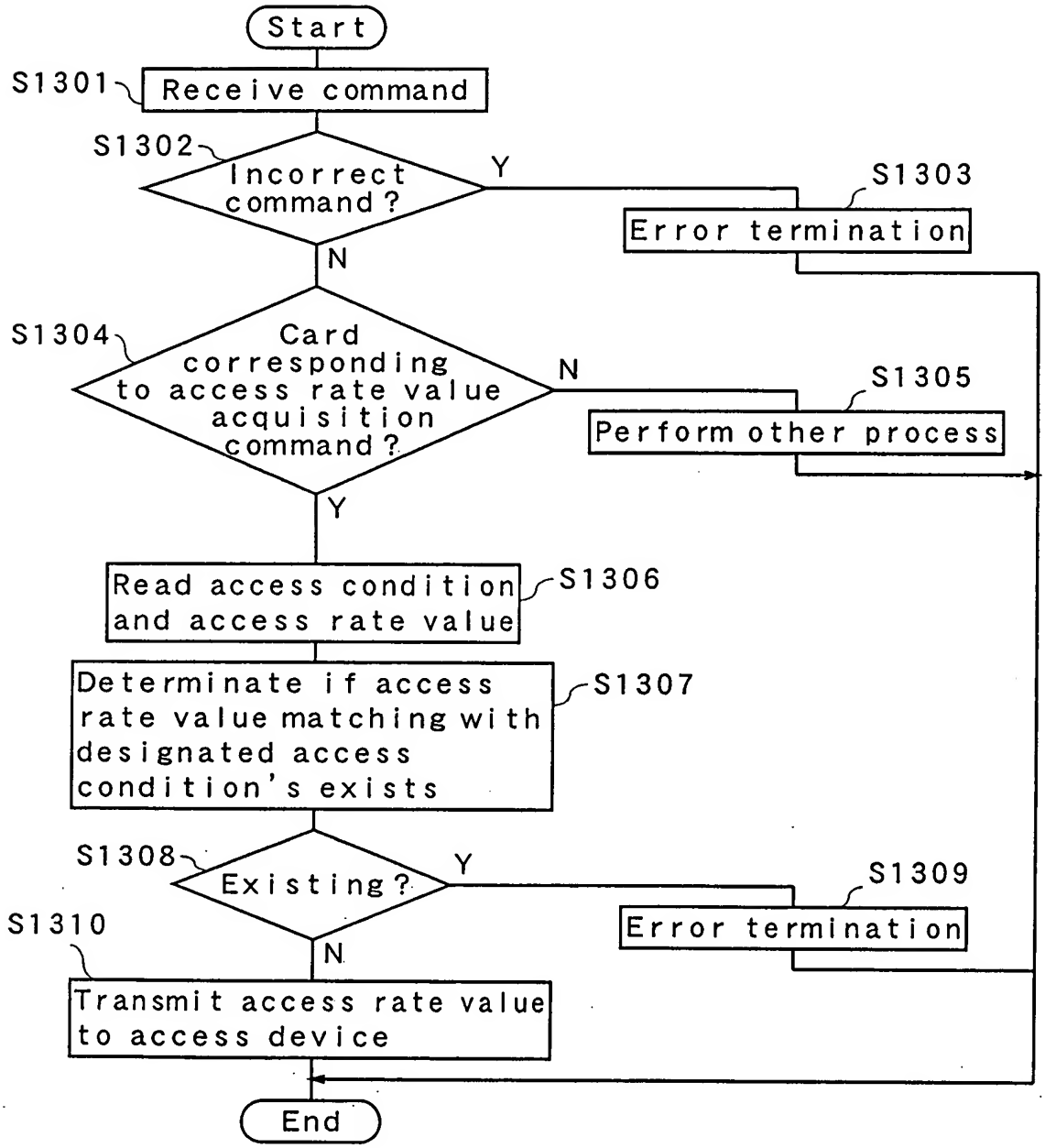

Start
S1301
Receive command
S1302
Incorrect command?
Y
S1303
Error termination
N
S1304
Card corresponding to access rate value acquisition command?
N
S1305
Perform other process
Y
Read access condition and access rate value
S1306
Determinate if access rate value matching with designated access condition's exists
S1307
S1308
Existing?
Y
S1309
Error termination
S1310
N
Transmit access rate value to access device
End

FIG. 14

(a)

Items	Condition values
Process unit size	128 KB
Process unit boundary	128 KB
Access method	Sequentially accessing to sequential area having 256 KB
Input clock frequency	25 MHz
Bit width	4 bits

(b)

Transfer rate of reading(standard) = 11 MB/s
Transfer rate of writing(standard) = 10 MB/s
Transfer rate of erasing(standard) = 10.3 MB/s
Transfer rate of reading(worst) = 6 MB/s
Transfer rate of writing(worst) = 5 MB/s
Transfer rate of erasing(worst) = 5.1 MB/s

FIG. 15

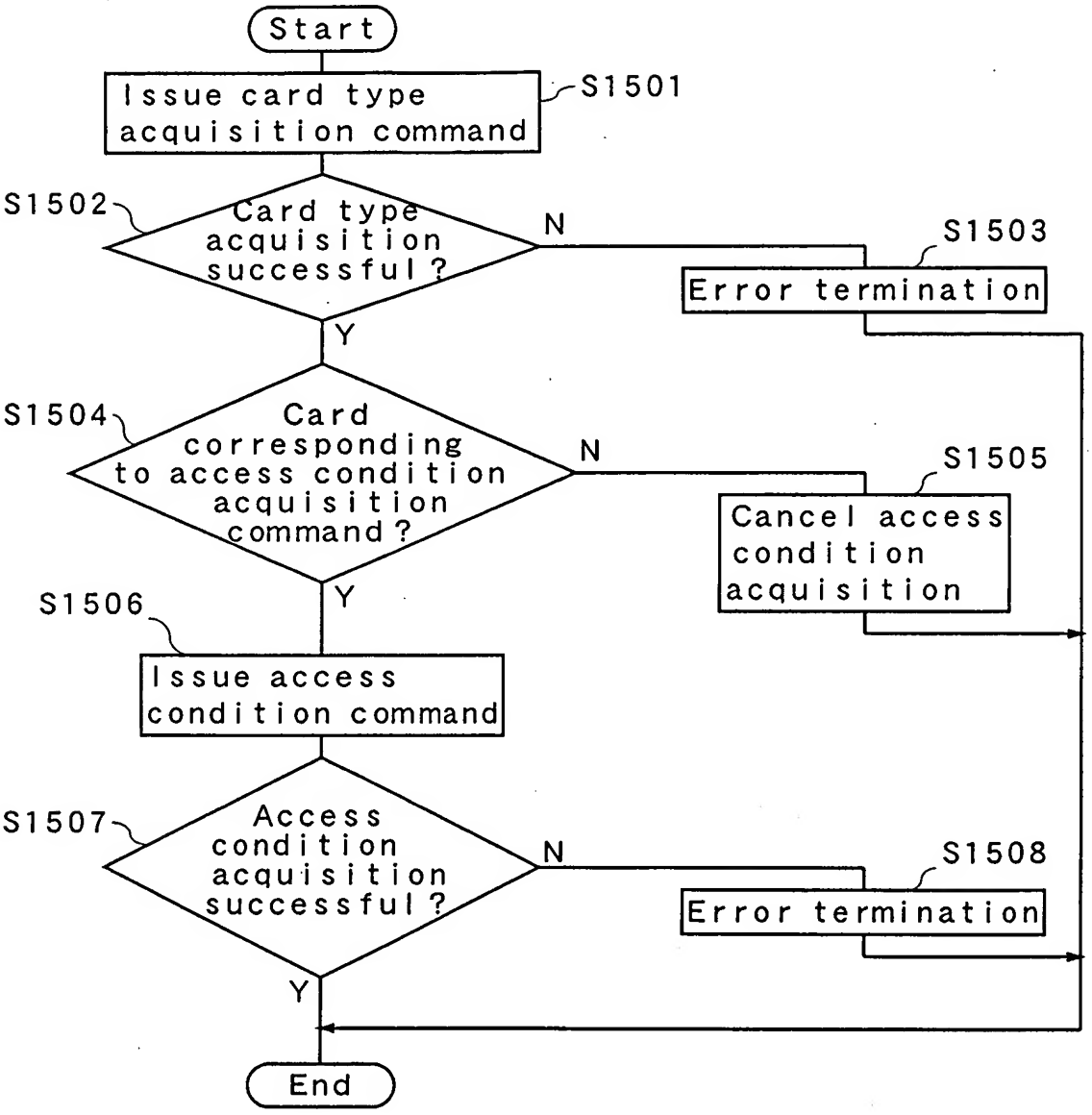

Start
Issue card type acquisition command
S1501
S1502
Card type acquisition successful?
N
S1503
Error termination
Y
S1504
Card corresponding to access condition acquisition command?
N
S1505
Cancel access condition acquisition
Y
S1506
Issue access condition command
S1507
Access condition acquisition successful?
N
S1508
Error termination
Y
End

FIG. 16

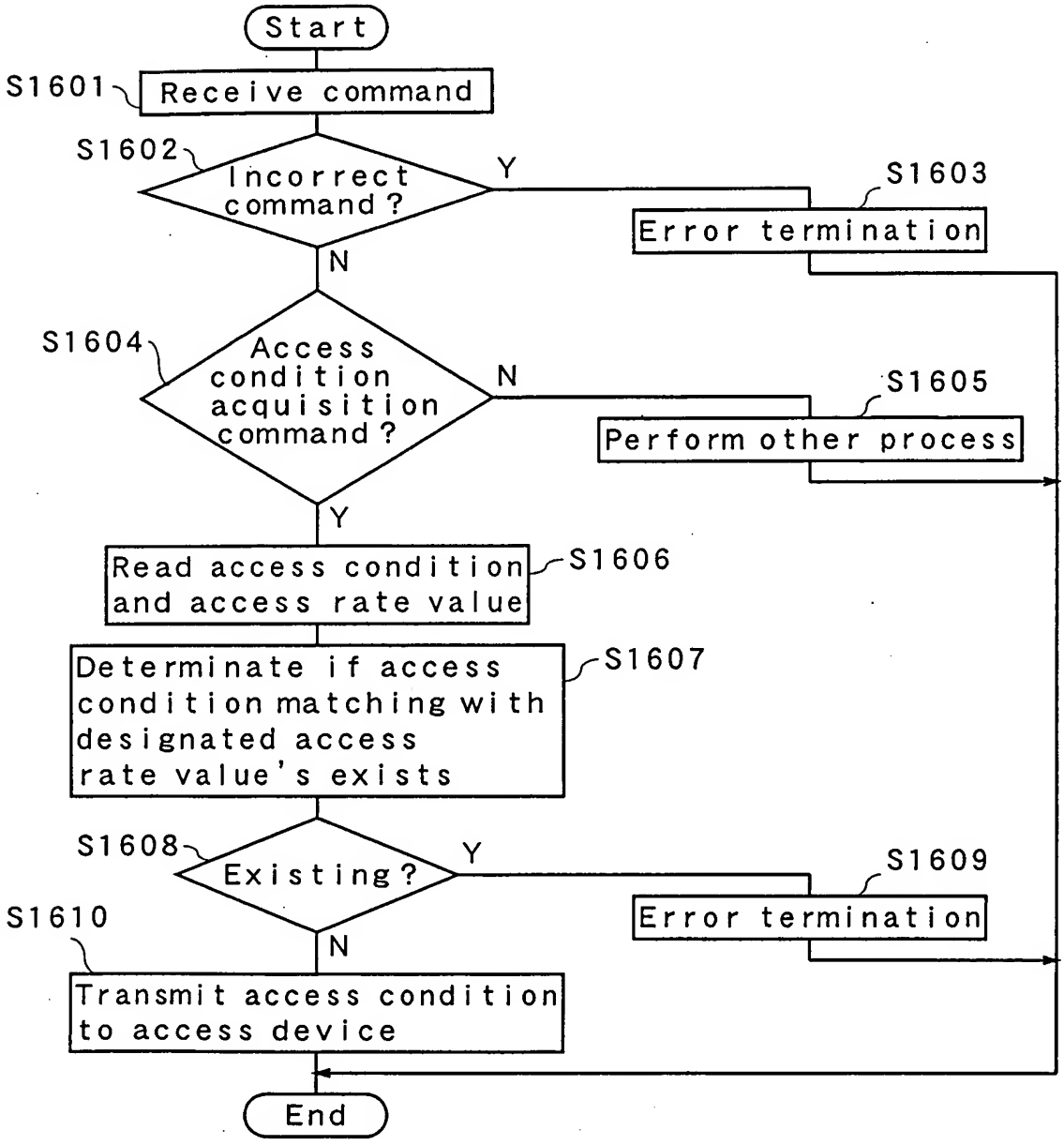

Start
S1601
Receive command
S1602
Incorrect command ?
Y
S1603
Error termination
N
S1604
Access condition acquisition command ?
N
S1605
Perform other process
Y
Read access condition and access rate value
S1606
Determinate if access condition matching with designated access rate value's exists
S1607
S1608
Existing ?
Y
S1609
Error termination
S1610
N
Transmit access condition to access device
End

FIG. 17

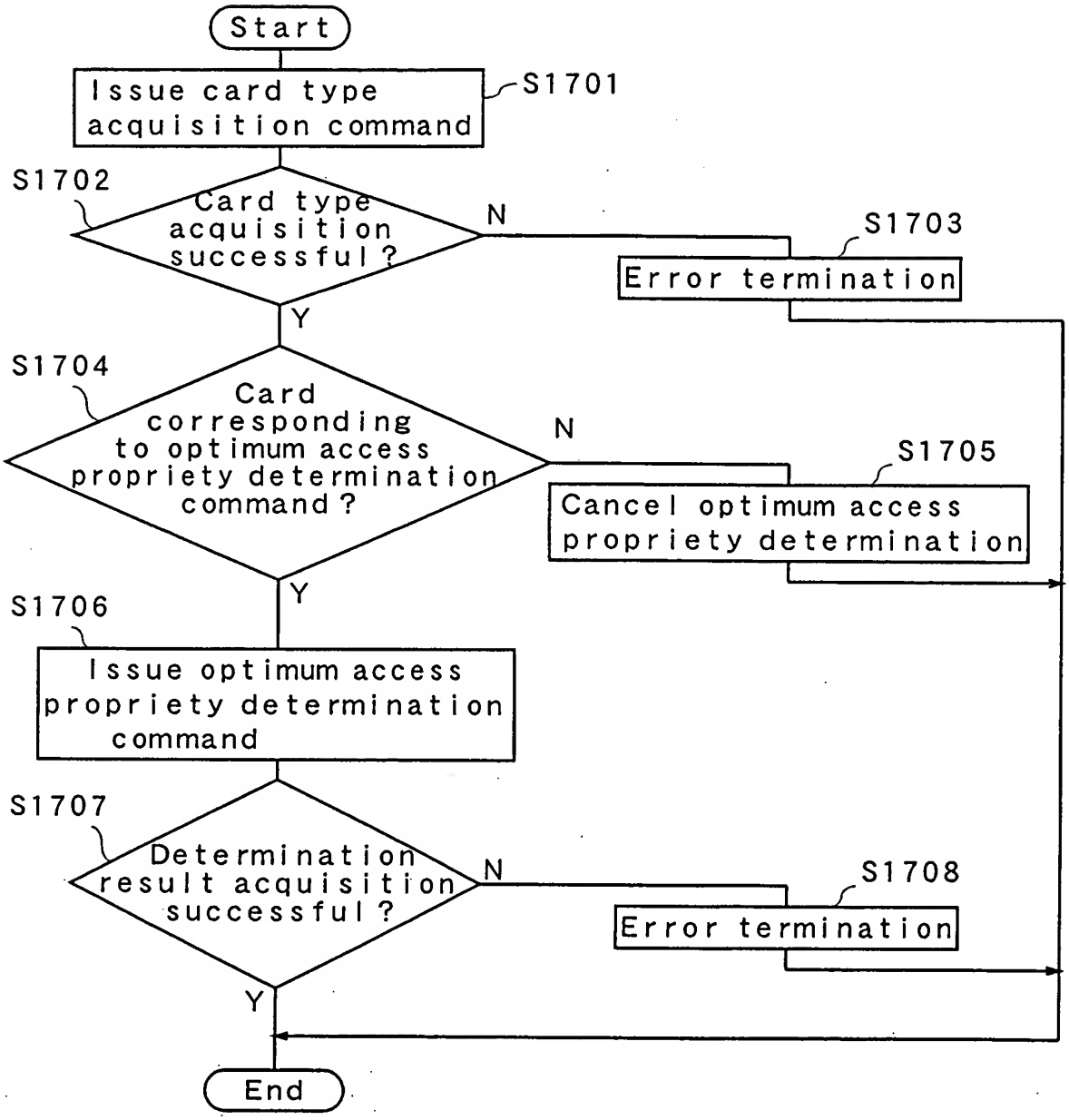

Start
Issue card type acquisition command
S1701
S1702
Card type acquisition successful?
N
S1703
Error termination
Y
S1704
Card corresponding to optimum access propriety determination command?
N
S1705
Cancel optimum access propriety determination
Y
S1706
Issue optimum access propriety determination command
S1707
Determination result acquisition successful?
N
S1708
Error termination
Y
End

FIG. 18

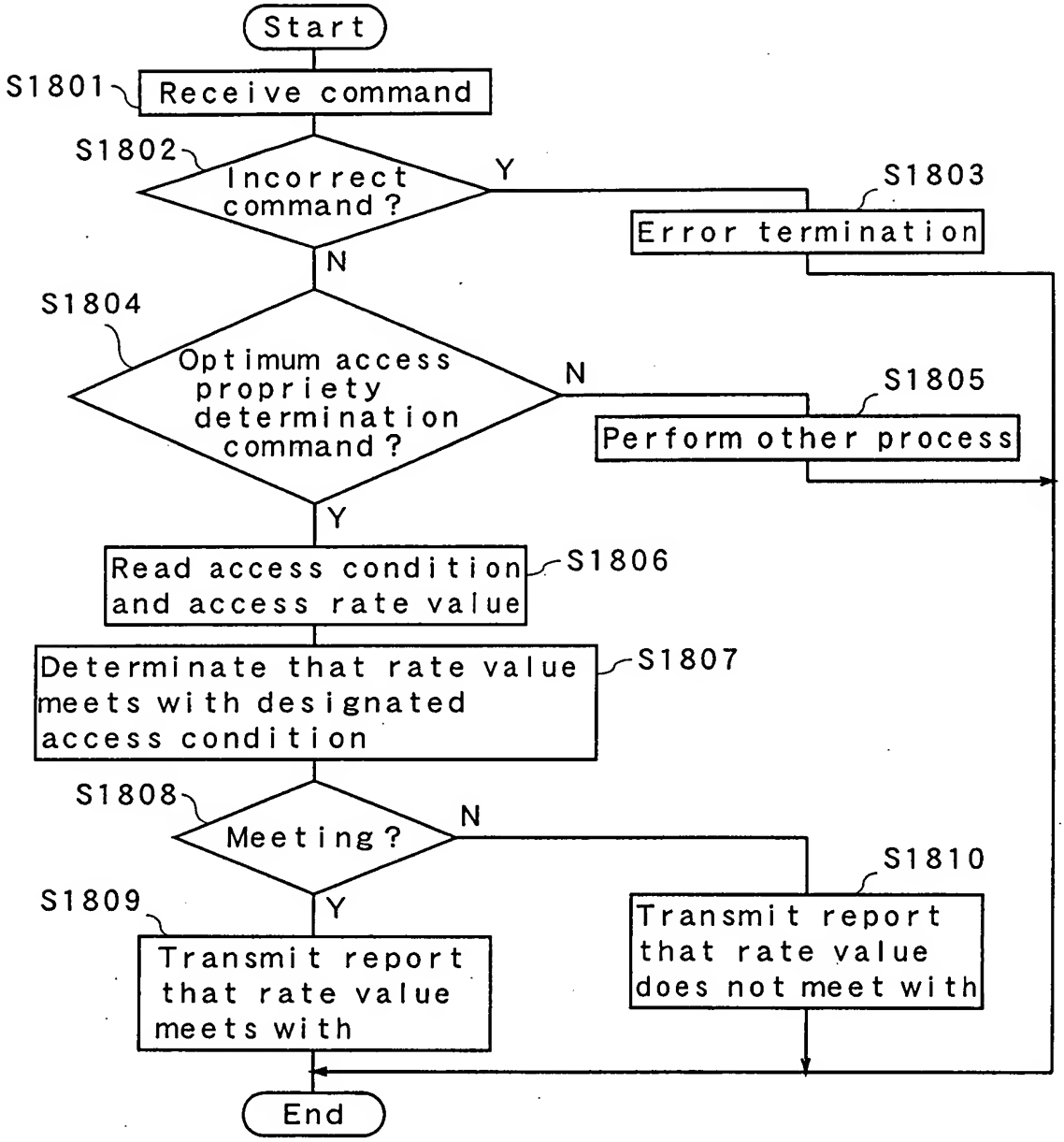

Start
S1801
Receive command
S1802
Incorrect command ?
Y
S1803
Error termination
N
S1804
Optimum access propriety determination command ?
N
S1805
Perform other process
Y
Read access condition and access rate value
S1806
Determinate that rate value meets with designated access condition
S1807
S1808
Meeting ?
N
S1810
Transmit report that rate value does not meet with
S1809
Y
Transmit report that rate value meets with
End

FIG. 19

(a)

		Process contents		
		Reading	Writing	Erasing
Rate performance level	High	Standard trans. rate >=8.0MB/s	Standard trans. rate >=8.0MB/s	Standard trans. rate >=8.0MB/s
	Medium	4.0MB/s=< Standard trans. rate <=8.0MB/s	4.0MB/s=< Standard trans. rate <=8.0MB/s	4.0MB/s=< Standard trans. rate <=8.0MB/s
	Low	Standard trans. rate <4.0MB/s	Standard trans. rate <4.0MB/s	Standard trans. rate <4.0MB/s

(b)

Transfer rate	Rate performance level
Transfer rate of reading(standard)=11MB/s	High
Transfer rate of writing(standard)=10MB/s	High
Transfer rate of erasing(standard)=10.3MB/s	High
Transfer rate of reading(worst)=6MB/s	High
Transfer rate of writing(worst)=5MB/s	High
Transfer rate of erasing(worst)=5.1MB/s	High

FIG. 20

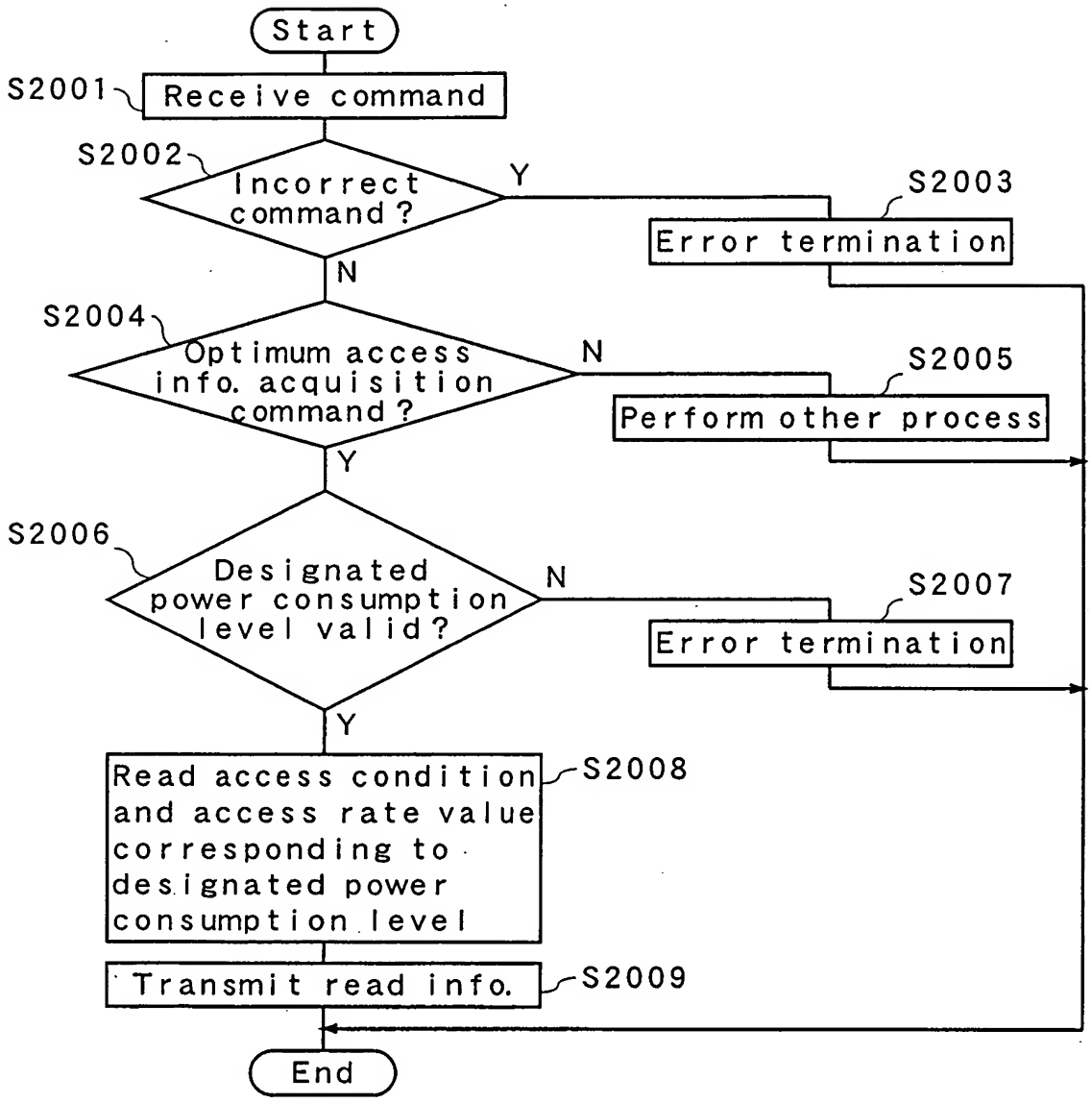

Start
S2001
Receive command
S2002
Incorrect command?
Y
S2003
Error termination
N
S2004
Optimum access info. acquisition command?
N
S2005
Perform other process
Y
S2006
Designated power consumption level valid?
N
S2007
Error termination
Y
Read access condition and access rate value corresponding to designated power consumption level
S2008
Transmit read info.
S2009
End

FIG. 21

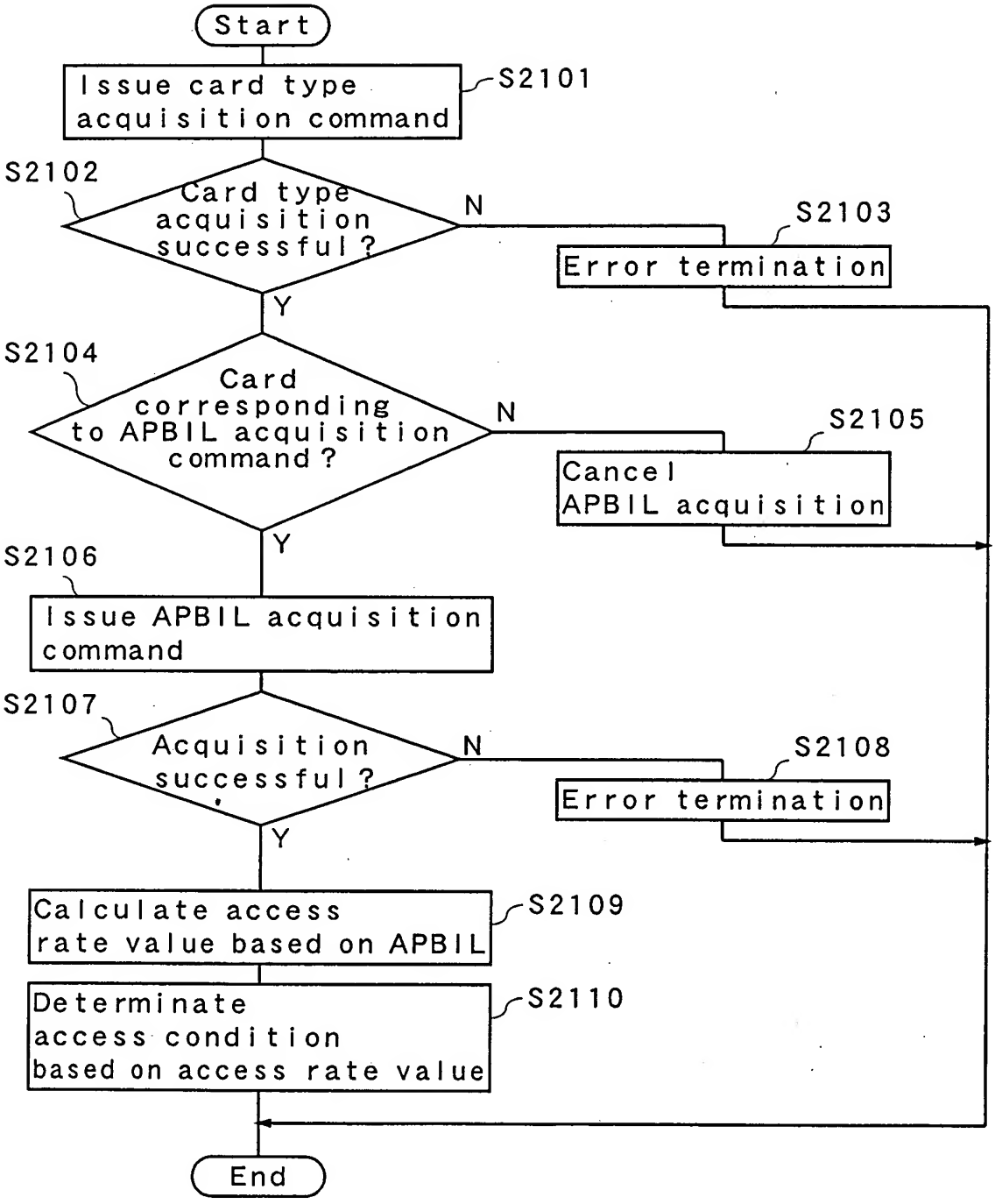

Start
Issue card type acquisition command
S2101
S2102
Card type acquisition successful?
N
S2103
Error termination
Y
S2104
Card corresponding to APBIL acquisition command?
N
S2105
Cancel APBIL acquisition
Y
S2106
Issue APBIL acquisition command
S2107
Acquisition successful?
N
S2108
Error termination
Y
Calculate access rate value based on APBIL
S2109
Determinate access condition based on access rate value
S2110
End

FIG. 22

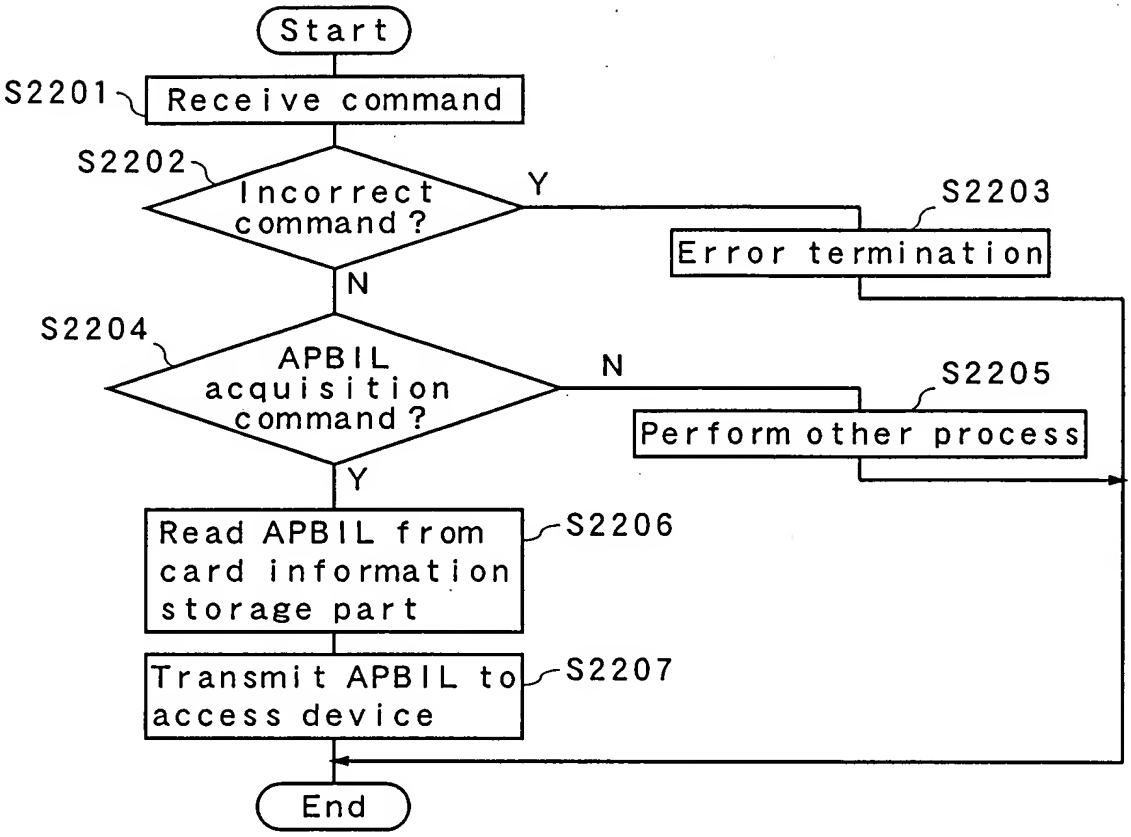
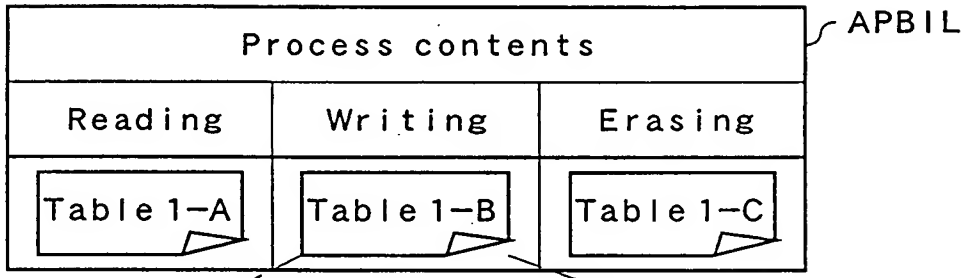

Start
S2201
Receive command
S2202
Incorrect command ?
Y
S2203
Error termination
N
S2204
APBIL acquisition command ?
N
S2205
Perform other process
Y
Read APBIL from card information storage part
S2206
Transmit APBIL to access device
S2207
End

FIG. 23

(a)



(b)

		Standard value		Worst value	
		SA	RA	SA	RA
Process unit size	512 Bytes	17ms	25ms	25ms	51ms
	16 KB	43 μs	690 μs	128 μs	1.6ms
	128 KB	9.2 μs	22 μs	60 μs	86 μs
	256 KB	9.2 μs	22 μs	60 μs	86 μs
	1 MB	9.2 μs	22 μs	60 μs	86 μs

FIG. 24

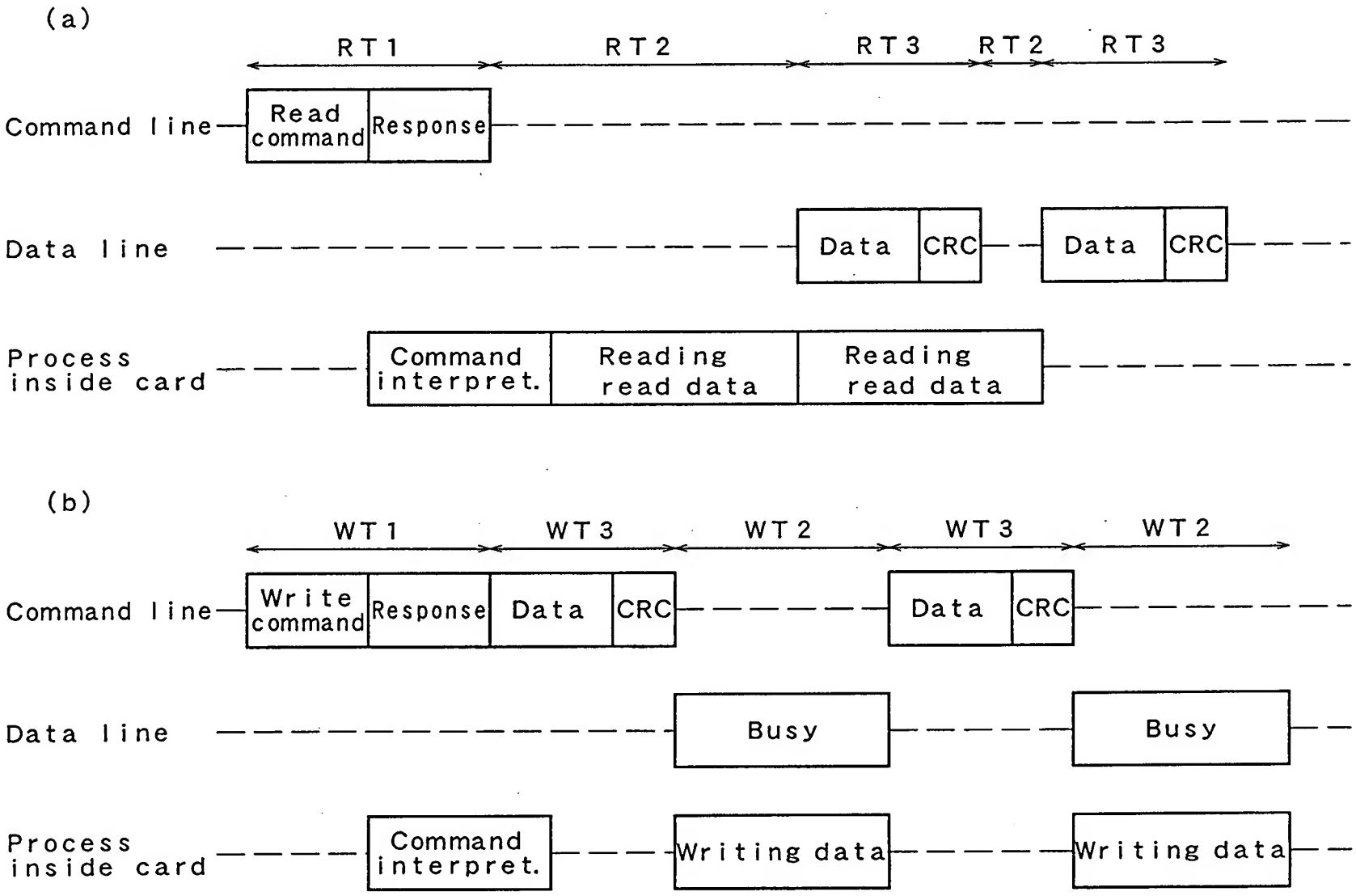

(a)
RT1
RT2
RT3
RT2
RT3
Command line
Read command
Response
Data line
Data
CRC
Data
CRC
Process inside card
Command interpret.
Reading read data
Reading read data
(b)
WT1
WT3
WT2
WT3
WT2
Command line
Write command
Response
Data
CRC
Data
CRC
Data line
Busy
Busy
Process inside card
Command interpret.
Writing data
Writing data

FIG. 25

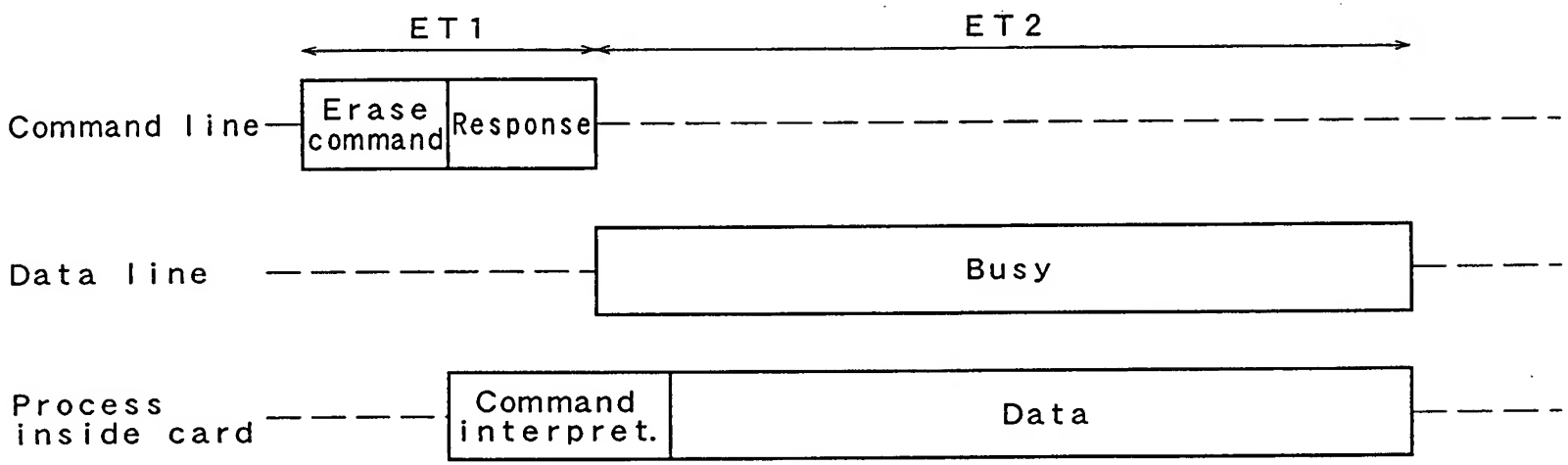

ET1
ET2
Command line
Erase command
Response
Data line
Busy
Process inside card
Command interpret.
Data

FIG. 26

(a)

		Process contents		
		Reading	Writing	Erasing
Input clock	12.5 MHz	Table 1-A	Table 1-B	Table 1-C
	25 MHz	Table 2-A	Table 2-B	Table 2-C
	50 MHz	Table 3-A	Table 3-B	Table 3-C

(b)

		Standard value		Worst value	
		SA	RA	SA	RA
Process unit size	512 Bytes	0.03 MB/s	0.02 MB/s	0.02 MB/s	0.01 MB/s
	16 KB	6 MB/s	0.7 MB/s	3 MB/s	0.3 MB/s
	128 KB	10 MB/s	8 MB/s	5 MB/s	4 MB/s
	256 KB	10 MB/s	8 MB/s	5 MB/s	4 MB/s
	1 MB	10 MB/s	8 MB/s	5 MB/s	4 MB/s

FIG. 27

(a)

		Process contents		
		Reading	Writing	Erasing
Input clock	12.5MHz	Table 1-A	Table 1-B	Table 1-C
	25MHz	Table 2-A	Table 2-B	Table 2-C
	50MHz	Table 3-A	Table 3-B	Table 3-C

(b)

		Standard value		Worst value	
		SA	RA	SA	RA
Process unit size	512 Bytes	17ms	26ms	26ms	51ms
	16KB	3ms	23ms	5ms	55ms
	128KB	13ms	16ms	26ms	33ms
	256KB	26ms	33ms	52ms	66ms
	1MB	105ms	131ms	210ms	262ms

FIG. 28

(a)

		Process contents		
		Reading	Writing	Erasing
Input clock	12.5 MHz	Table 1-A	Table 1-B	Table 1-C
	25 MHz	Table 2-A	Table 2-B	Table 2-C
	50 MHz	Table 3-A	Table 3-B	Table 3-C

(b)

		Standard value		Worst value	
		SA	RA	SA	RA
Process unit size	512 Bytes	0.03 MB/s	0.02 MB/s	0.02 MB/s	0.01 MB/s
	16 KB	6 MB/s	0.7 MB/s	3 MB/s	0.3 MB/s
	128 KB	10 MB/s	8 MB/s	5 MB/s	4 MB/s
	256 KB	10 MB/s	8 MB/s	5 MB/s	4 MB/s
	1 MB	10 MB/s	8 MB/s	5 MB/s	4 MB/s

FIG. 29

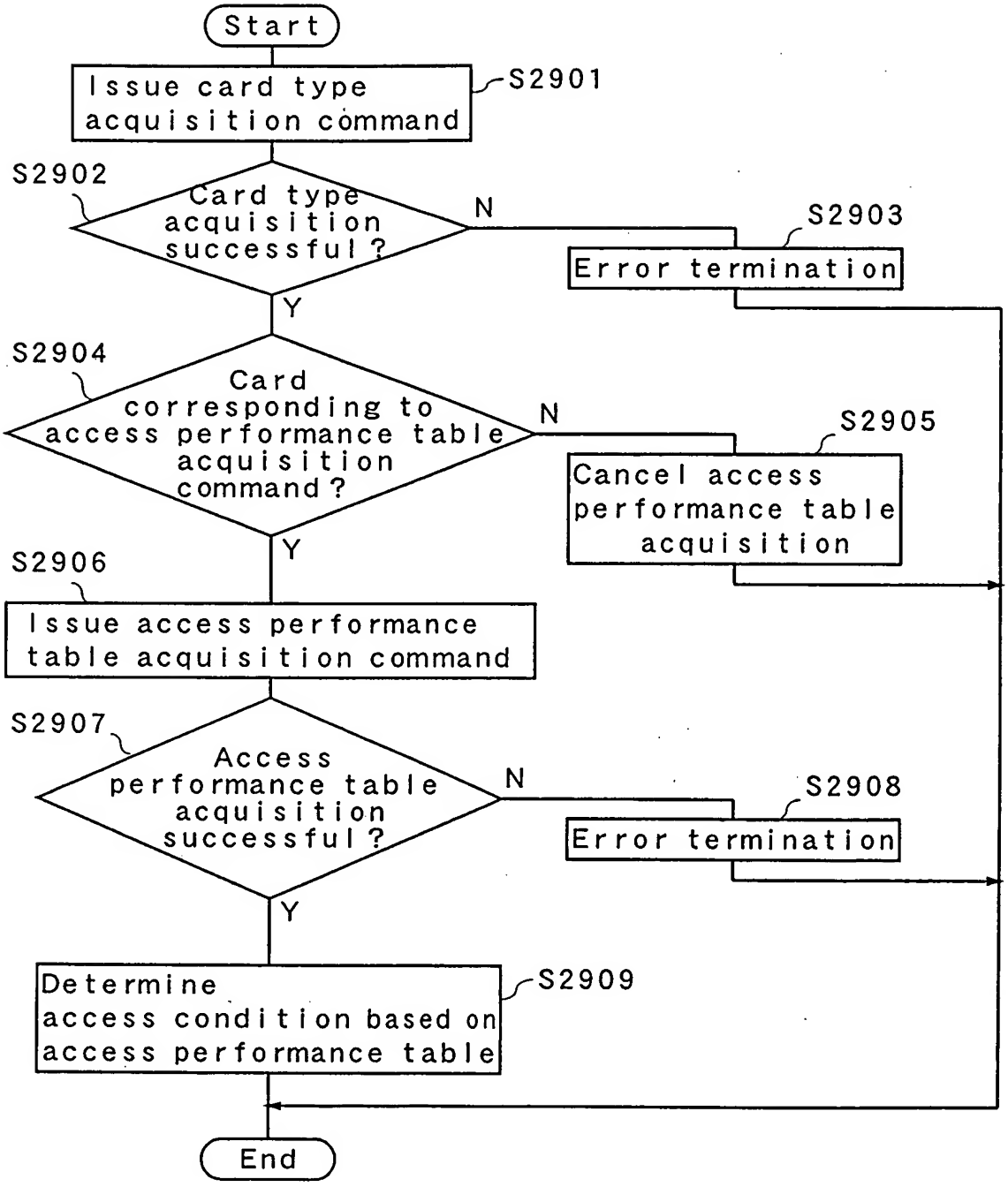

Start
Issue card type acquisition command
S2901
S2902
Card type acquisition successful?
N
S2903
Error termination
Y
S2904
Card corresponding to access performance table acquisition command?
N
S2905
Cancel access performance table acquisition
Y
S2906
Issue access performance table acquisition command
S2907
Access performance table acquisition successful?
N
S2908
Error termination
Y
Determine access condition based on access performance table
S2909
End

FIG. 30

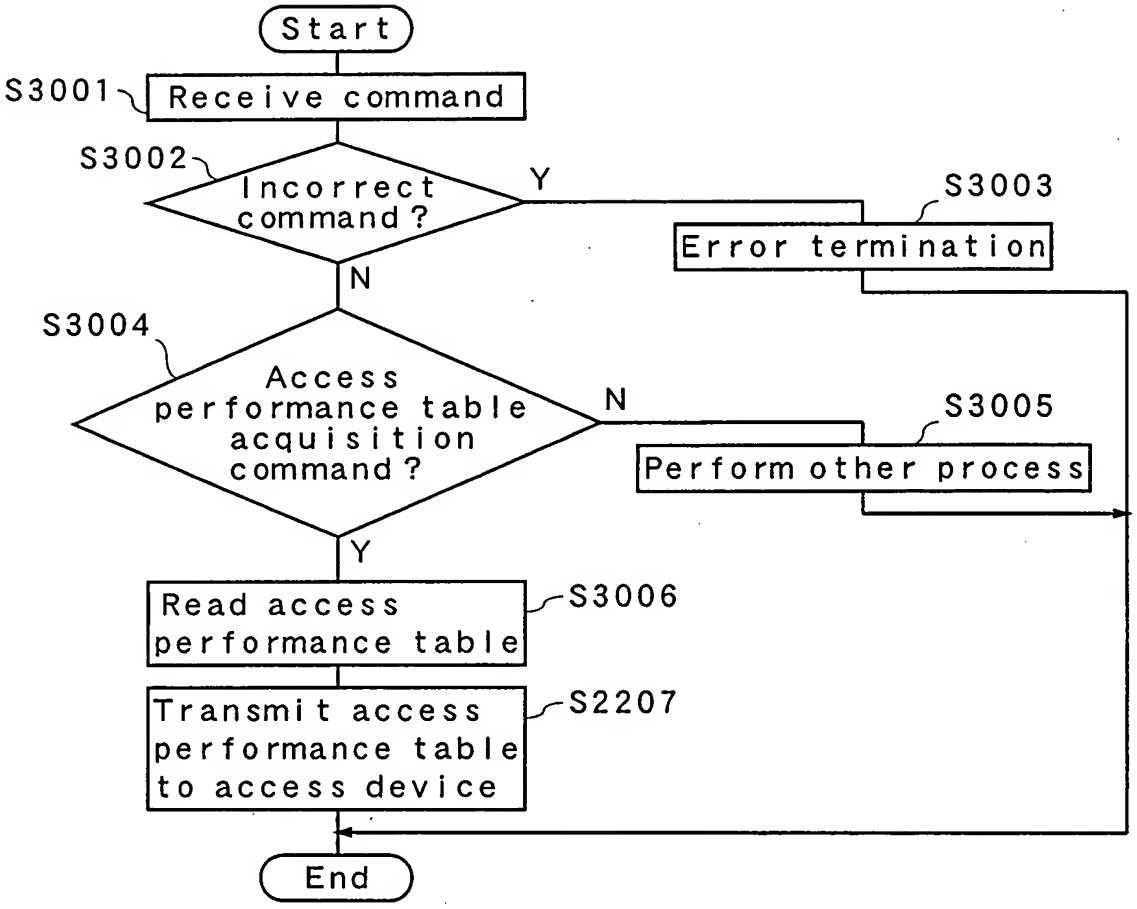

Start
S3001
Receive command
S3002
Incorrect command?
Y
S3003
Error termination
N
S3004
Access performance table acquisition command?
N
S3005
Perform other process
Y
Read access performance table
S3006
Transmit access performance table to access device
S2207
End

FIG. 31

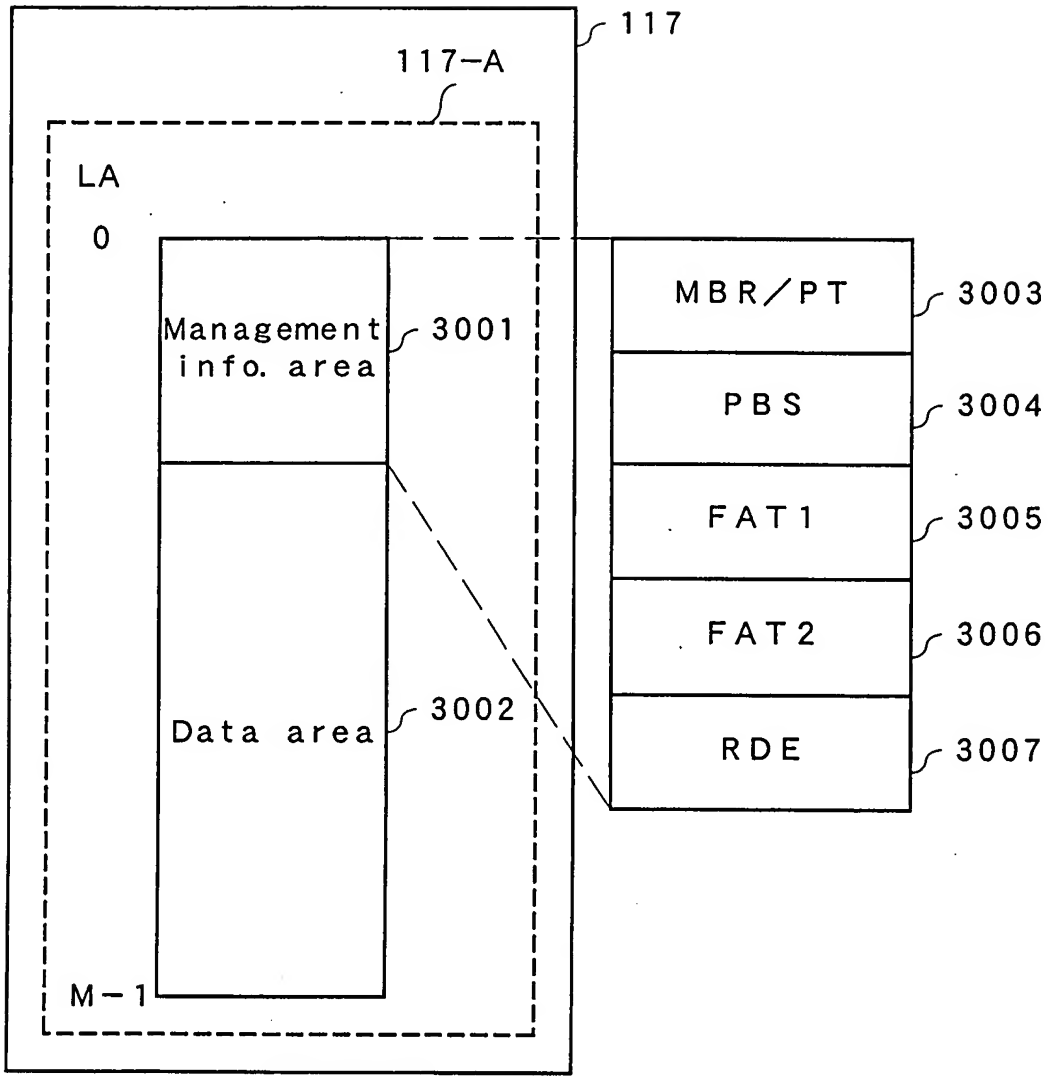

117
117-A
LA
0
Management info. area
3001
Data area
3002
M-1
MBR/PT
3003
PBS
3004
FAT1
3005
FAT2
3006
RDE
3007

FIG. 32

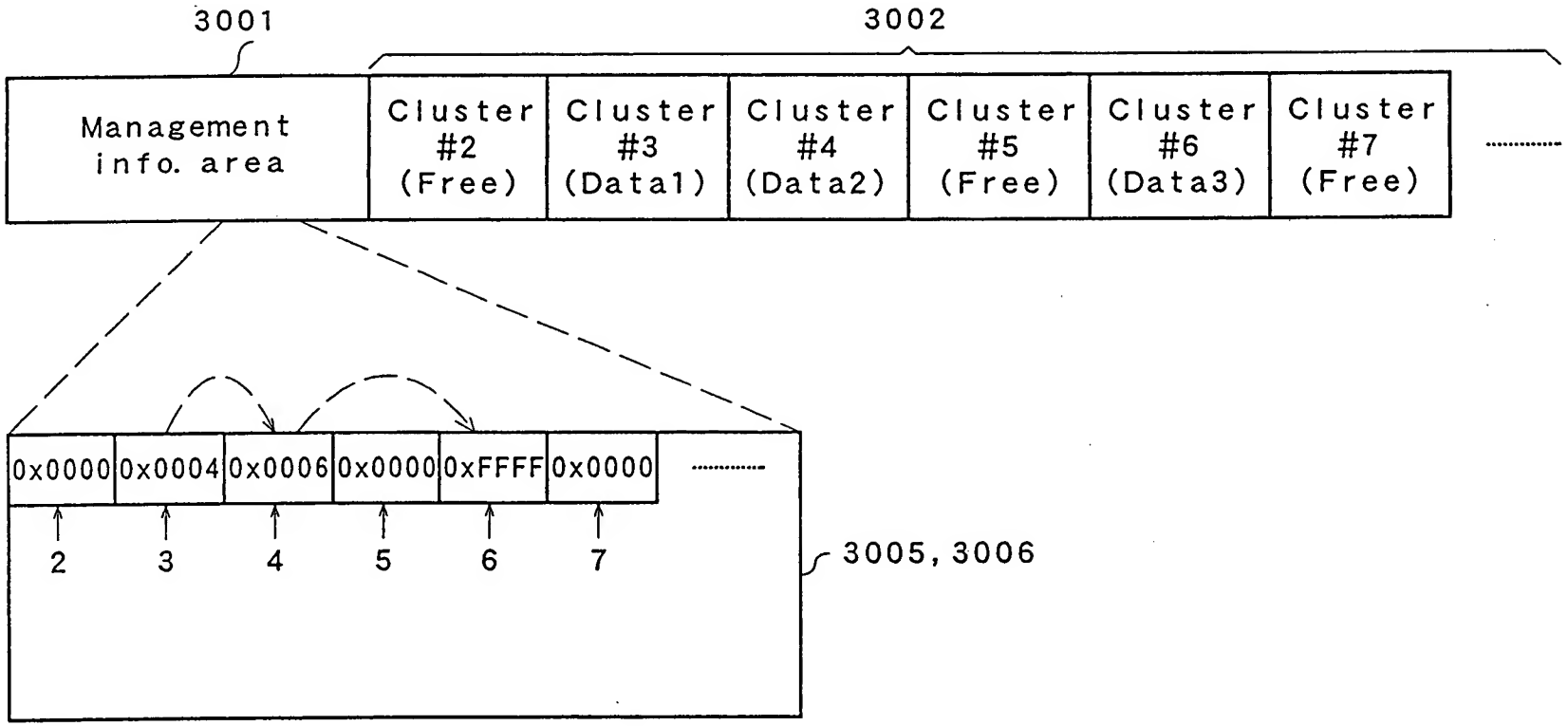

3001
3002
Management info. area
Cluster #2 (Free)
Cluster #3 (Data1)
Cluster #4 (Data2)
Cluster #5 (Free)
Cluster #6 (Data3)
Cluster #7 (Free)
0x0000
0x0004
0x0006
0x0000
0xFFFF
0x0000
2
3
4
5
6
7
3005, 3006

FIG. 33

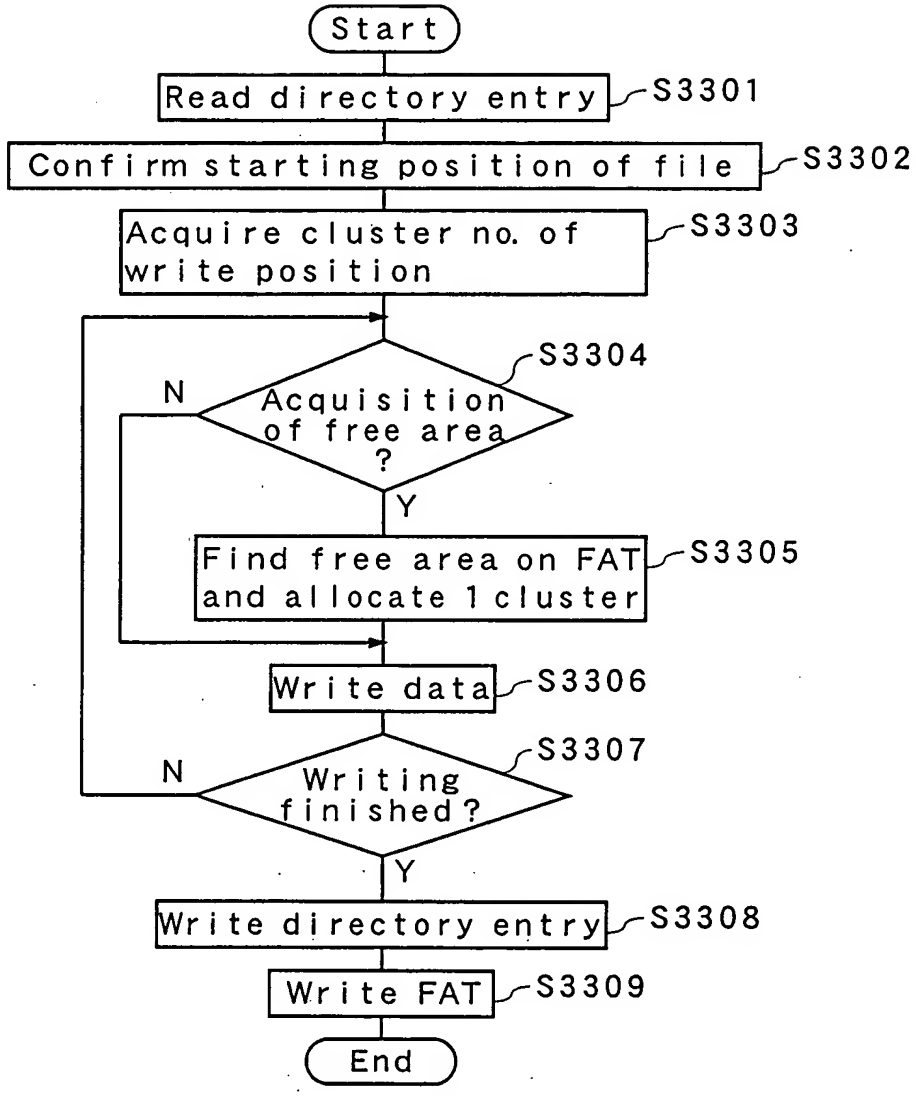

Start
Read directory entry
S3301
Confirm starting position of file
S3302
Acquire cluster no. of write position
S3303
S3304
Acquisition of free area ?
N
Y
Find free area on FAT and allocate 1 cluster
S3305
Write data
S3306
S3307
Writing finished?
N
Y
Write directory entry
S3308
Write FAT
S3309
End

FIG. 34

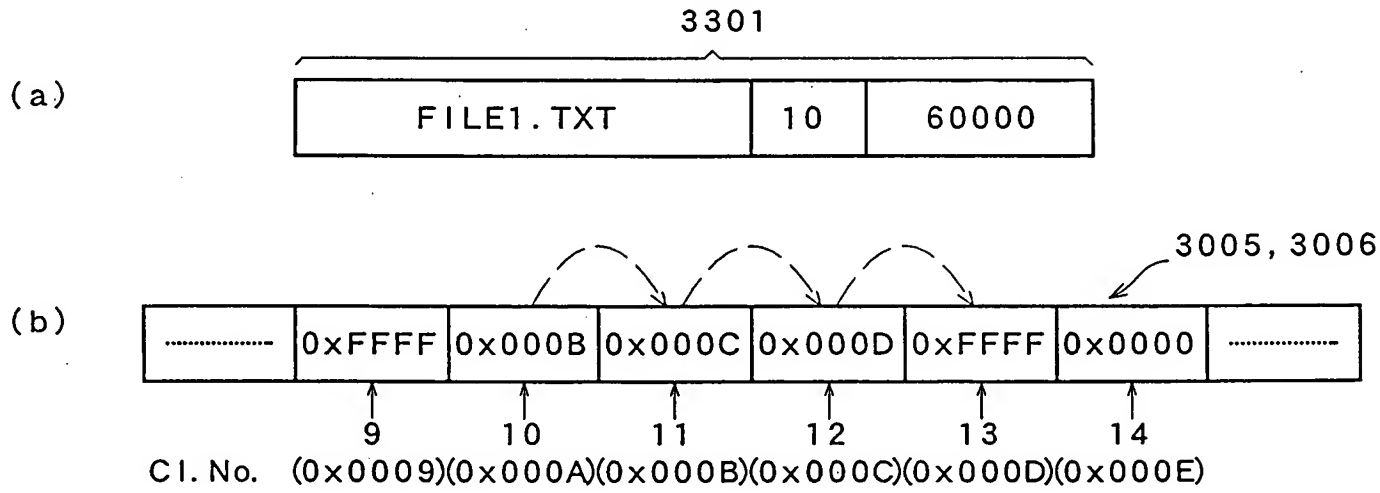

3301
(a)
FILE1.TXT
10
60000
3005, 3006
(b)
0xFFFF
0x000B
0x000C
0x000D
0xFFFF
0x0000
9
10
11
12
13
14
Cl. No.
(0x0009)(0x000A)(0x000B)(0x000C)(0x000D)(0x000E)
(c)
Cl. No.
3002
10
Data1 (Data start)
11
Data2
12
Data3
13
Data4 (Old data end)
14
Free area

FIG. 35

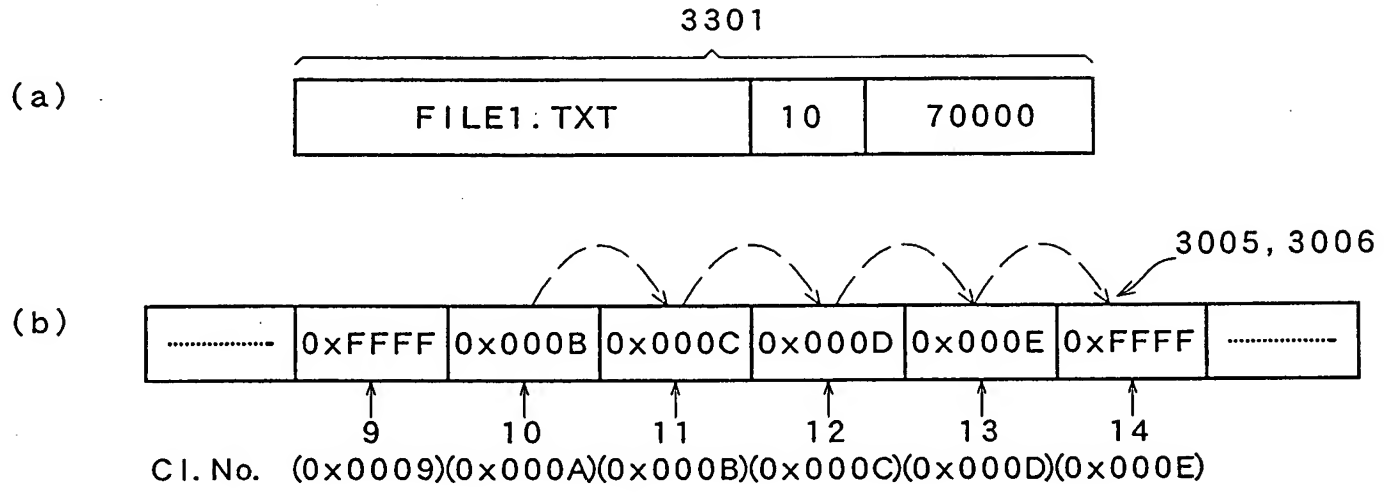

3301
(a)
FILE1.TXT
10
70000
3005, 3006
(b)
0xFFFF
0x000B
0x000C
0x000D
0x000E
0xFFFF
9
10
11
12
13
14
Cl. No.
(0x0009)(0x000A)(0x000B)(0x000C)(0x000D)(0x000E)
(c)
Cl. No.
3002
10
Data1 (Data start)
11
Data2
12
Data3
13
Data4
14
Data5 (New data end)

FIG. 36

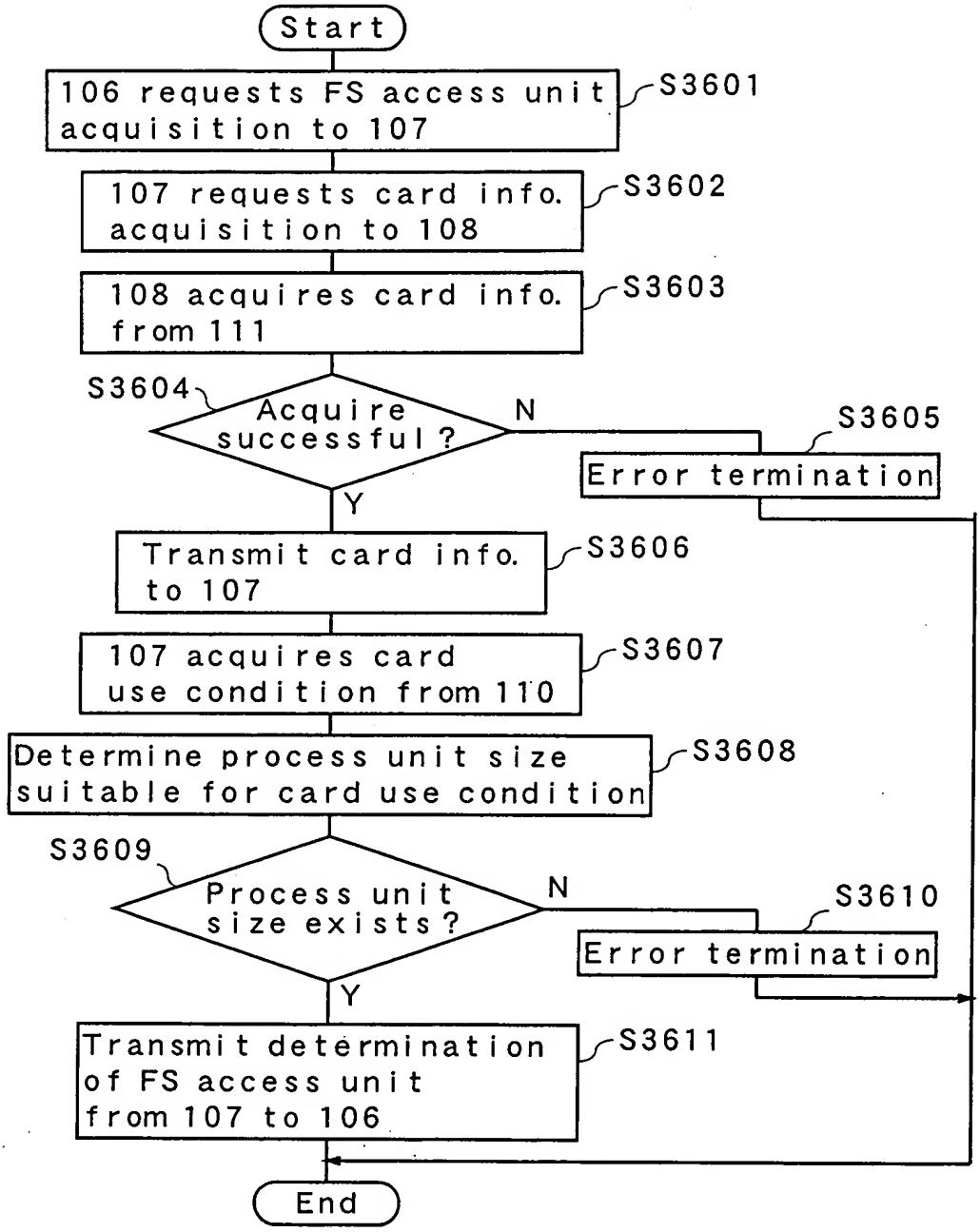

Start
106 requests FS access unit acquisition to 107
S3601
107 requests card info. acquisition to 108
S3602
108 acquires card info. from 111
S3603
S3604
Acquire successful?
N
S3605
Error termination
Y
Transmit card info. to 107
S3606
107 acquires card use condition from 110
S3607
Determine process unit size suitable for card use condition
S3608
S3609
Process unit size exists?
N
S3610
Error termination
Y
Transmit determination of FS access unit from 107 to 106
S3611
End

FIG. 37

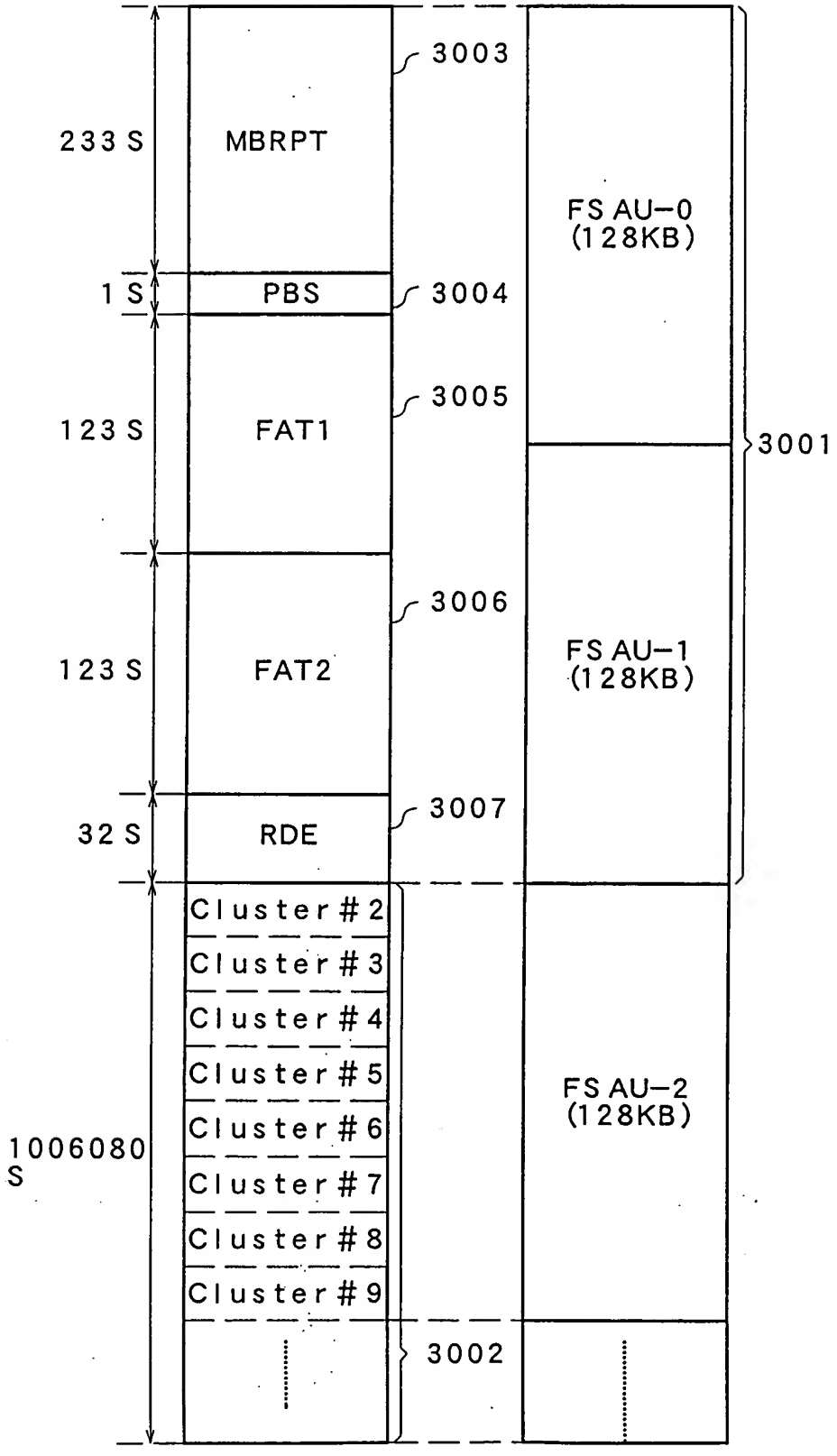

233 S
MBRPT
3003
FS AU-0
(128KB)
1 S
PBS
3004
123 S
FAT1
3005
3001
123 S
FAT2
3006
FS AU-1
(128KB)
32 S
RDE
3007
Cluster#2
Cluster#3
Cluster#4
Cluster#5
Cluster#6
Cluster#7
Cluster#8
Cluster#9
1006080
S
3002
FS AU-2
(128KB)

FIG. 38

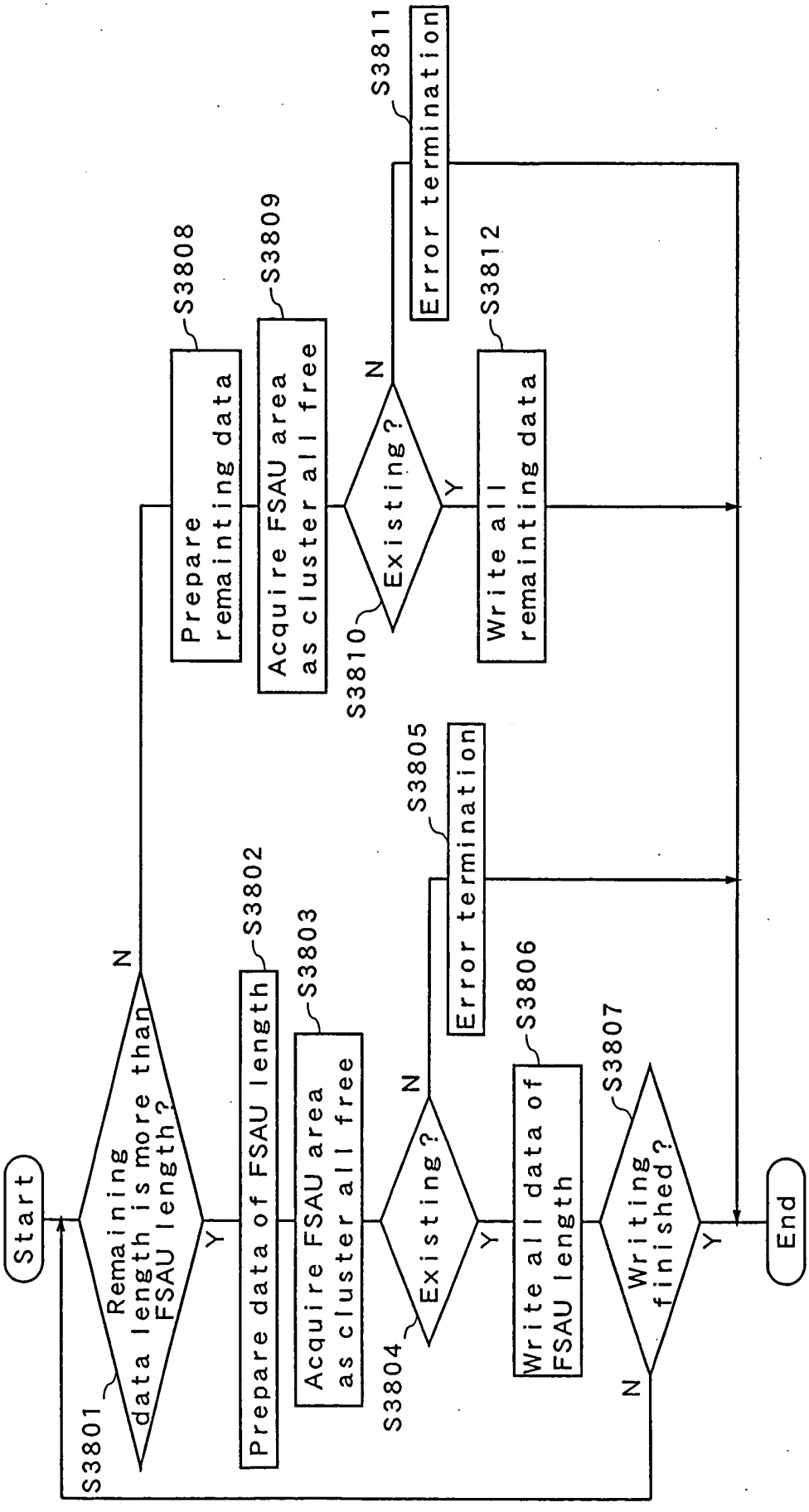

Start
S3801
Remaining data length is more than FSAU length?
N
Y
S3802
Prepare data of FSAU length
S3803
Acquire FSAU area as cluster all free
S3804
Existing?
N
S3805
Error termination
Y
S3806
Write all data of FSAU length
S3807
Writing finished?
N
Y
End
S3808
Prepare remainting data
S3809
Acquire FSAU area as cluster all free
S3810
Existing?
N
S3811
Error termination
Y
S3812
Write all remainting data

FIG. 39

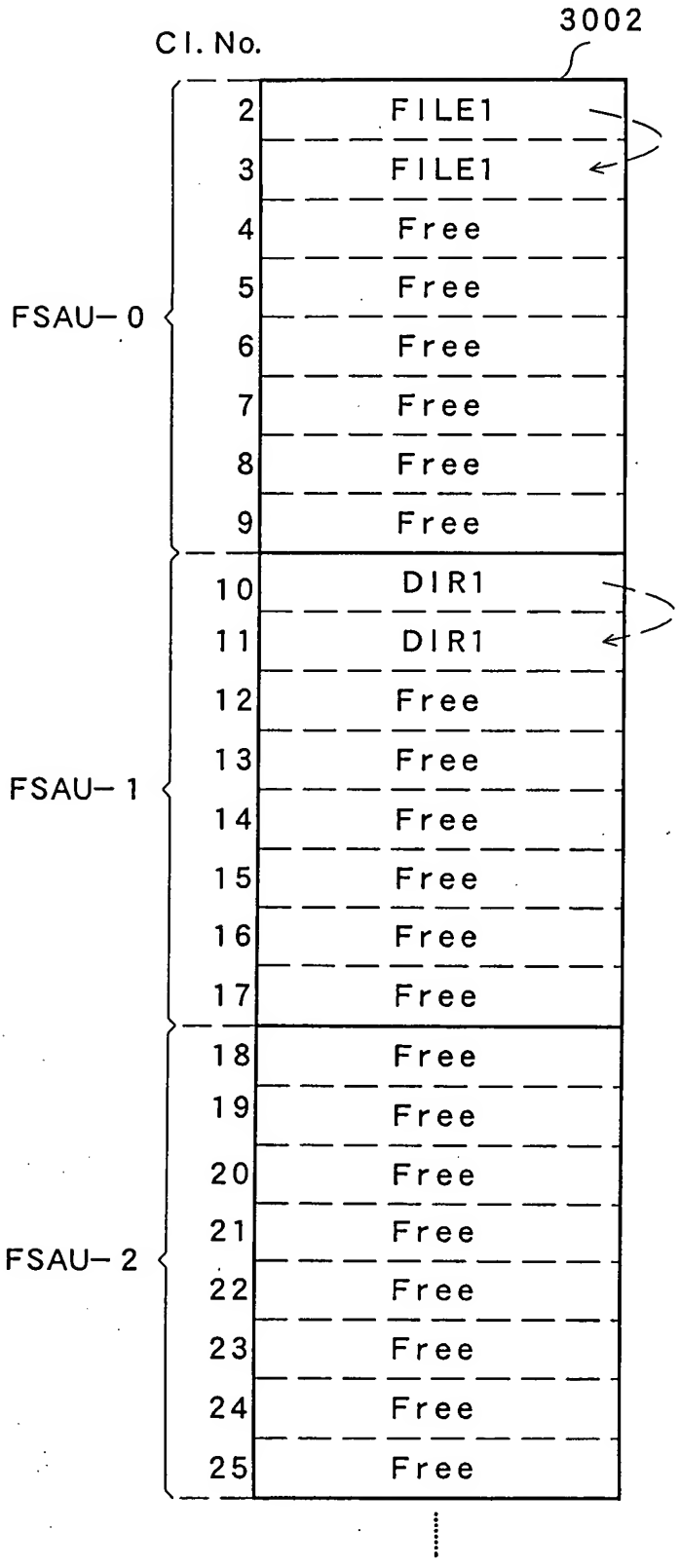

3002
Cl. No.
FSAU-0
FSAU-1
FSAU-2
2 FILE1
3 FILE1
4 Free
5 Free
6 Free
7 Free
8 Free
9 Free
10 DIR1
11 DIR1
12 Free
13 Free
14 Free
15 Free
16 Free
17 Free
18 Free
19 Free
20 Free
21 Free
22 Free
23 Free
24 Free
25 Free

FIG. 40

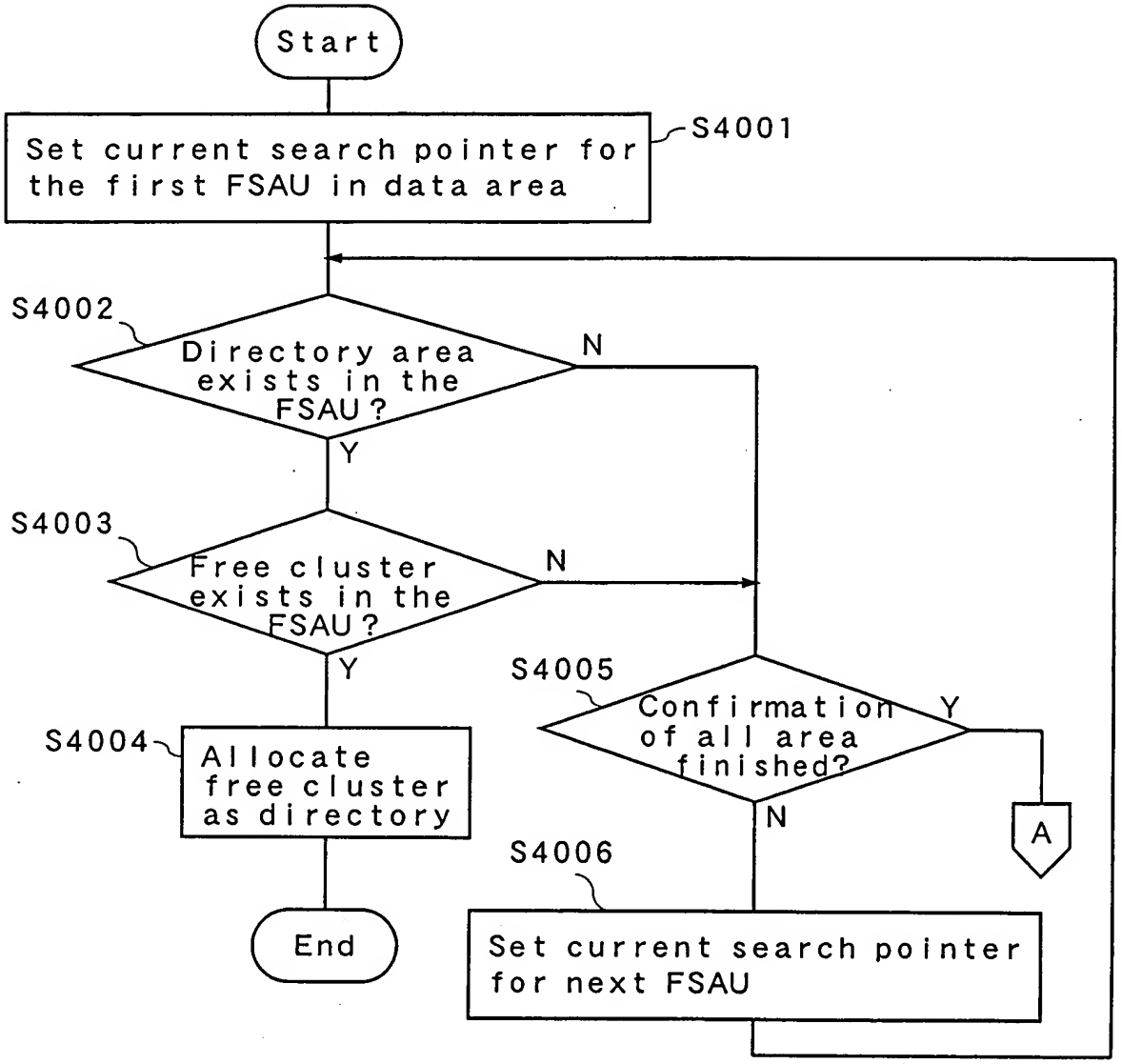

Start
Set current search pointer for the first FSAU in data area
S4001
S4002
Directory area exists in the FSAU?
N
Y
S4003
Free cluster exists in the FSAU?
N
Y
S4004
Allocate free cluster as directory
End
S4005
Confirmation of all area finished?
Y
N
A
S4006
Set current search pointer for next FSAU

FIG. 41

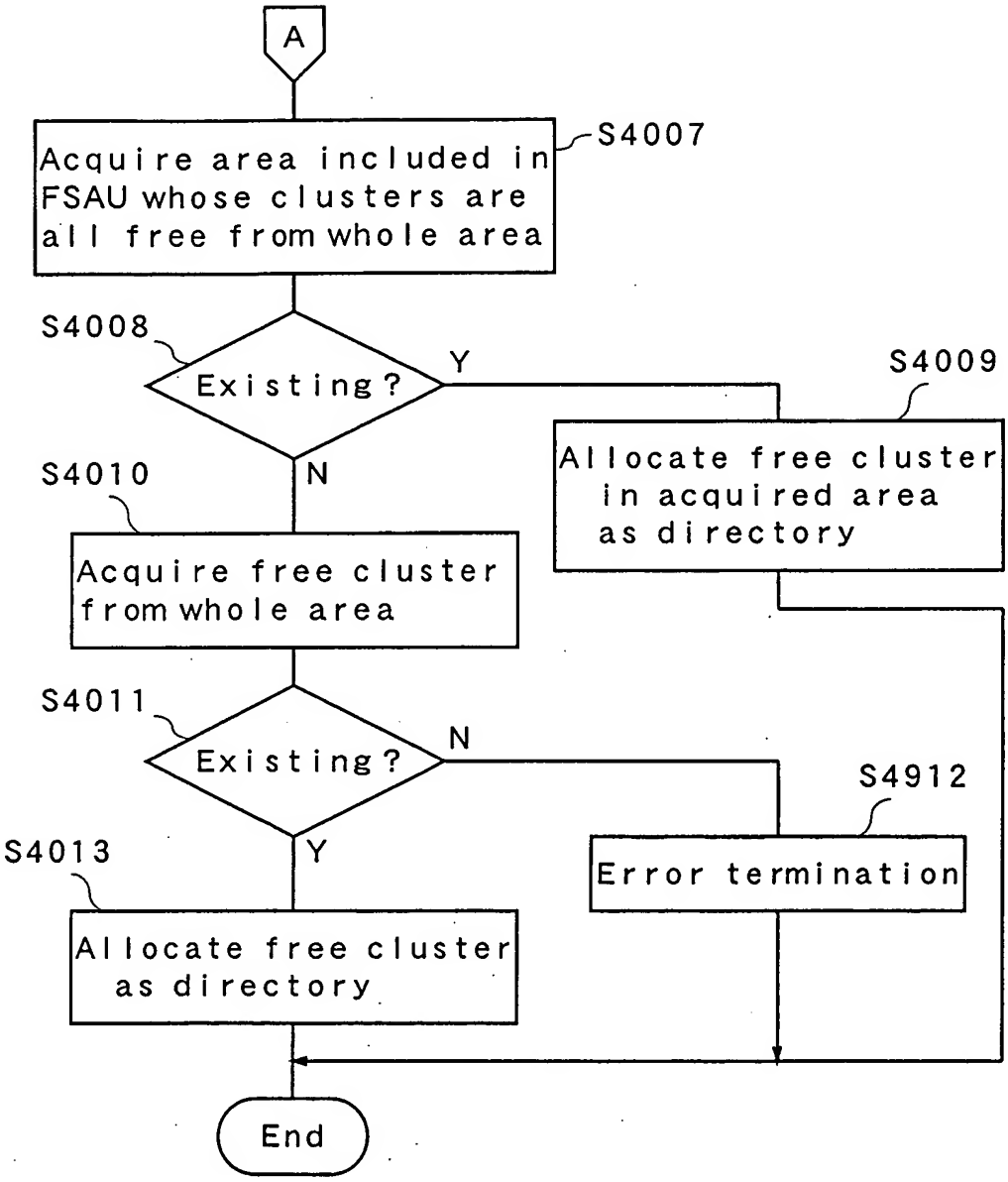

A
Acquire area included in FSAU whose clusters are all free from whole area
S4007
S4008
Existing?
Y
N
S4009
Allocate free cluster in acquired area as directory
S4010
Acquire free cluster from whole area
S4011
Existing?
N
Y
S4912
Error termination
S4013
Allocate free cluster as directory
End

FIG. 42

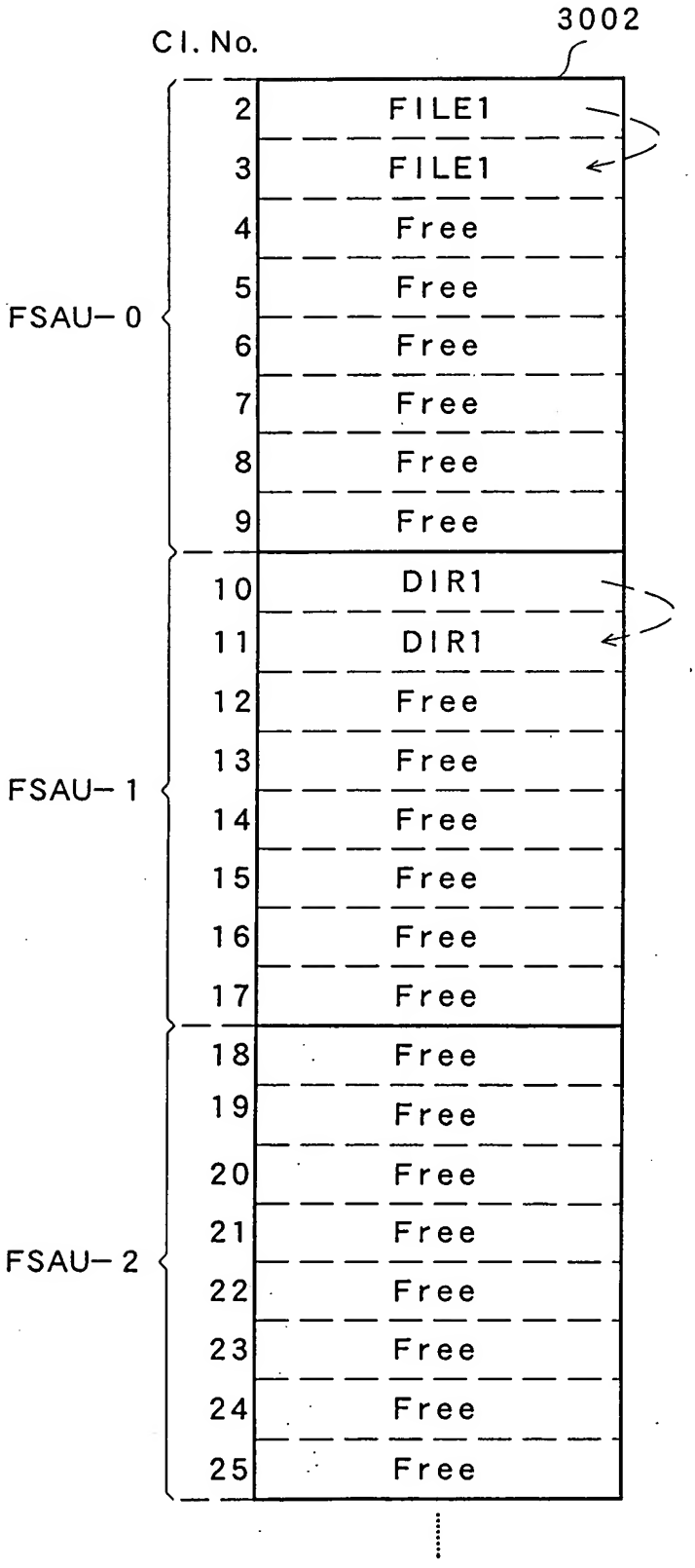

3002
Cl. No.
FSAU-0
FSAU-1
FSAU-2
2 FILE1
3 FILE1
4 Free
5 Free
6 Free
7 Free
8 Free
9 Free
10 DIR1
11 DIR1
12 Free
13 Free
14 Free
15 Free
16 Free
17 Free
18 Free
19 Free
20 Free
21 Free
22 Free
23 Free
24 Free
25 Free

FIG. 43

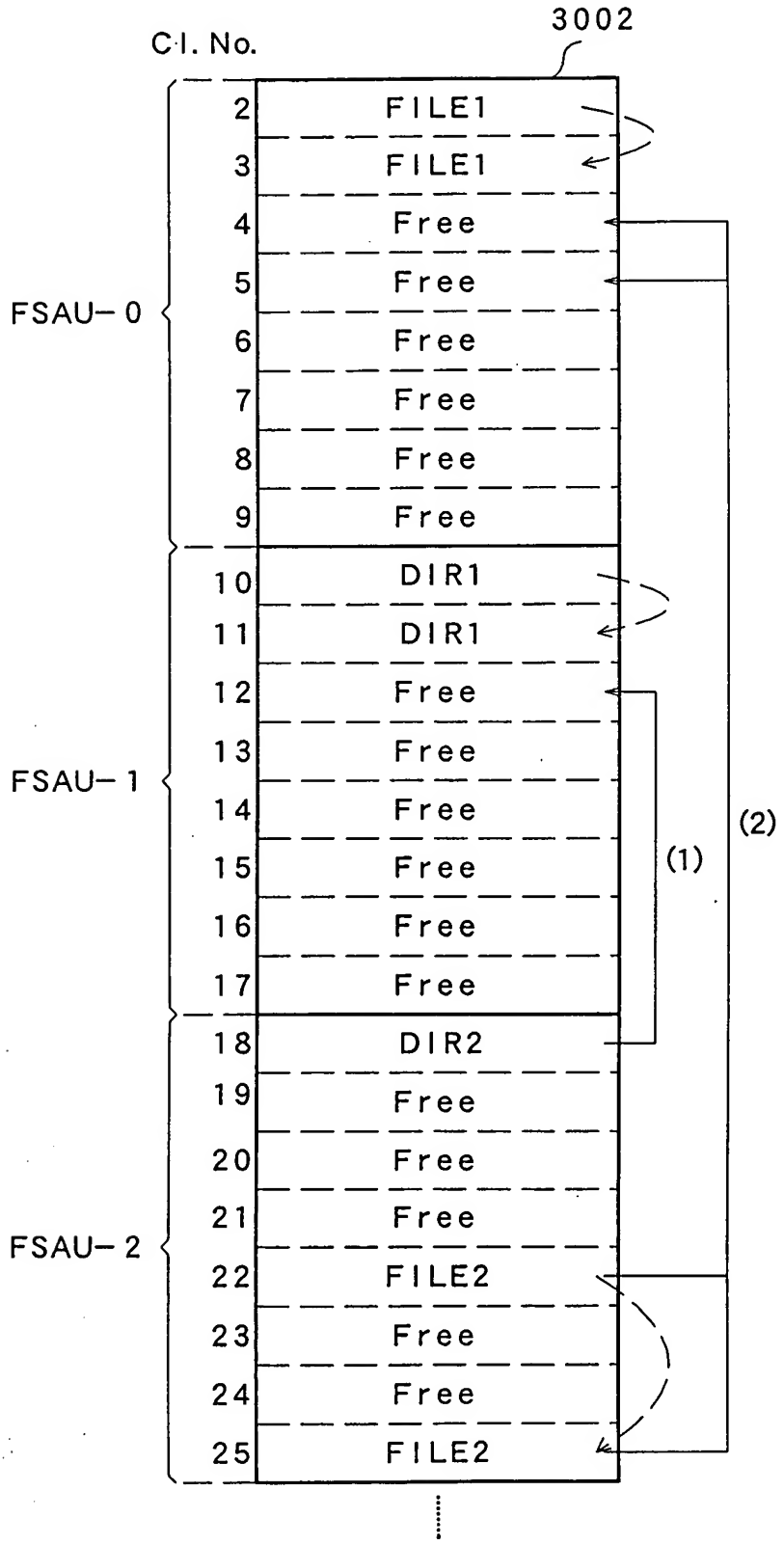

3002
Cl. No.
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
FILE1
FILE1
Free
Free
Free
Free
Free
Free
DIR1
DIR1
Free
Free
Free
Free
Free
DIR2
Free
Free
Free
FILE2
Free
Free
FILE2
FSAU-0
FSAU-1
FSAU-2
(1)
(2)

FIG. 44

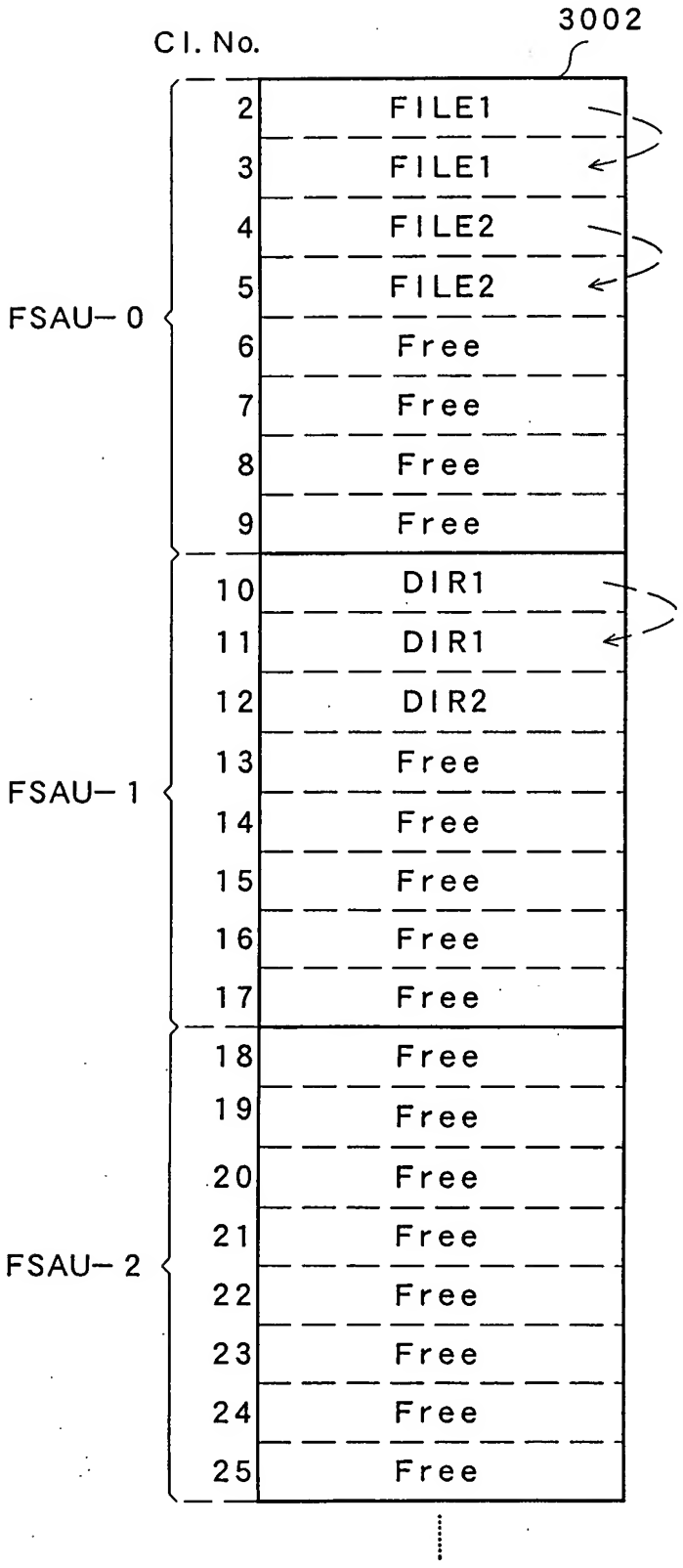

3002
Cl. No.
FSAU-0
FSAU-1
FSAU-2
2 FILE1
3 FILE1
4 FILE2
5 FILE2
6 Free
7 Free
8 Free
9 Free
10 DIR1
11 DIR1
12 DIR2
13 Free
14 Free
15 Free
16 Free
17 Free
18 Free
19 Free
20 Free
21 Free
22 Free
23 Free
24 Free
25 Free

FIG. 45

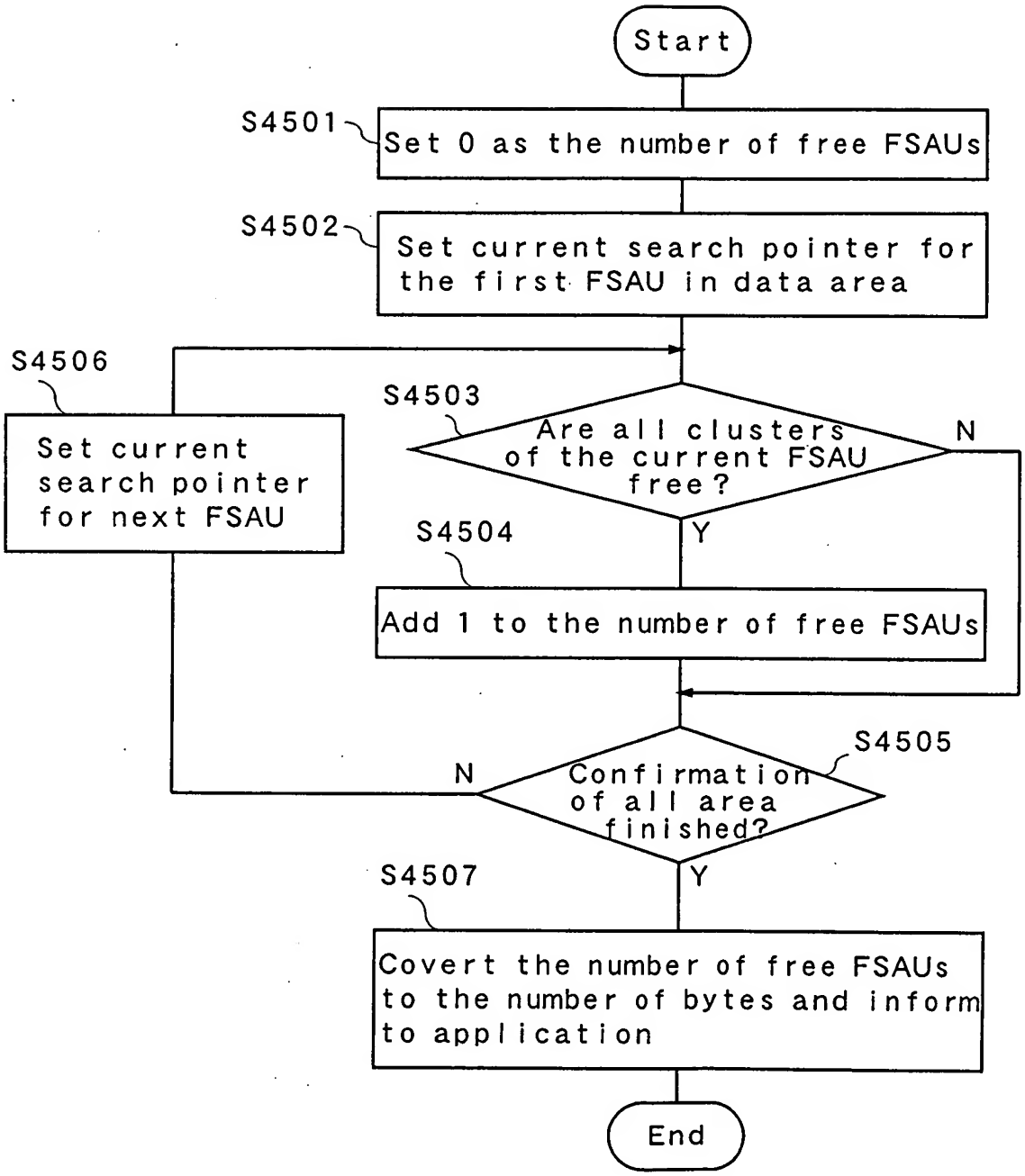
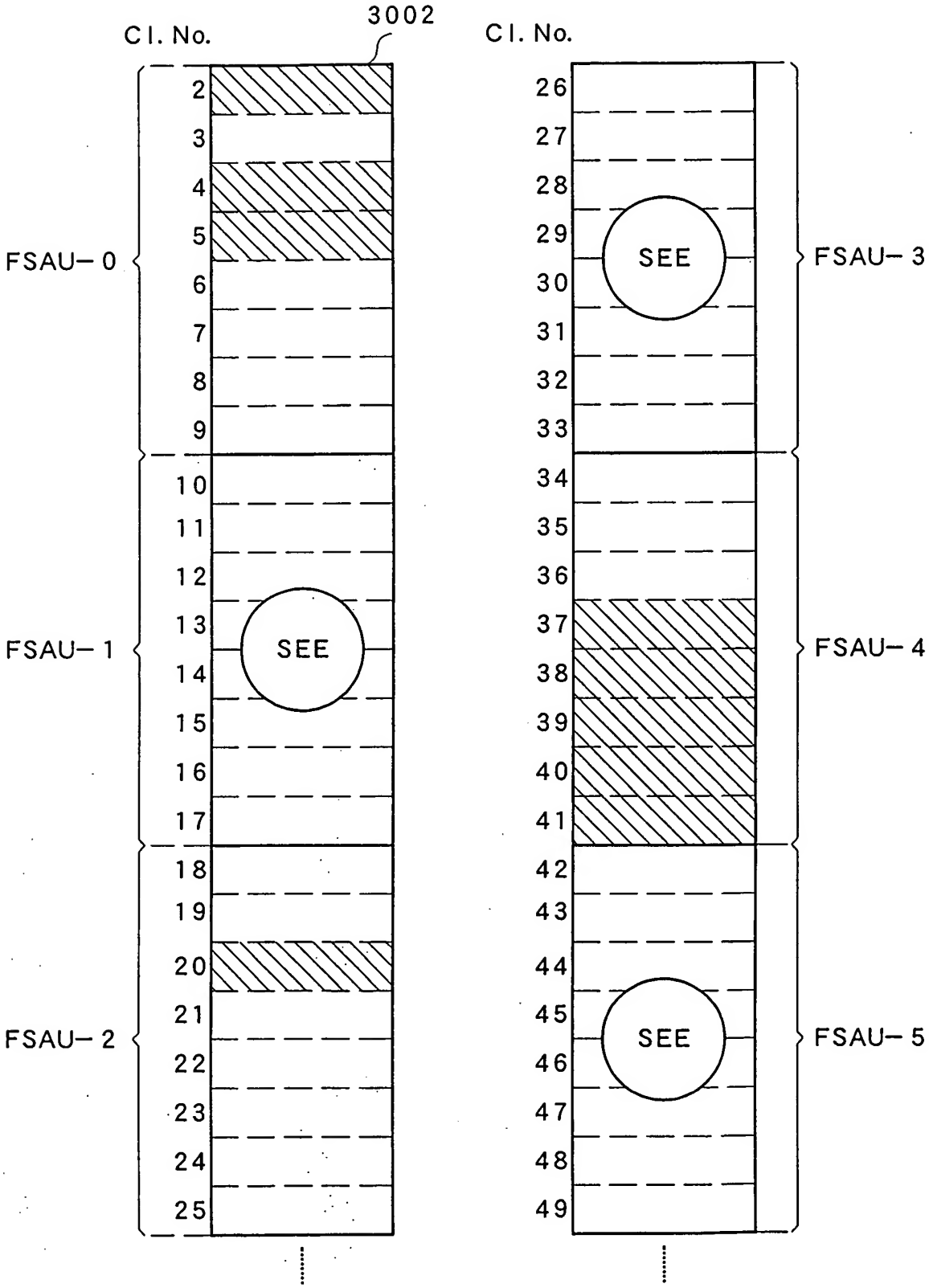

Start
S4501
Set 0 as the number of free FSAUs
S4502
Set current search pointer for the first FSAU in data area
S4506
Set current search pointer for next FSAU
S4503
Are all clusters of the current FSAU free?
N
Y
S4504
Add 1 to the number of free FSAUs
S4505
N
Confirmation of all area finished?
Y
S4507
Covert the number of free FSAUs to the number of bytes and inform to application
End

FIG. 46


3002
Cl. No.
Cl. No.
FSAU-0
FSAU-1
FSAU-2
FSAU-3
FSAU-4
FSAU-5
SEE
SEE
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
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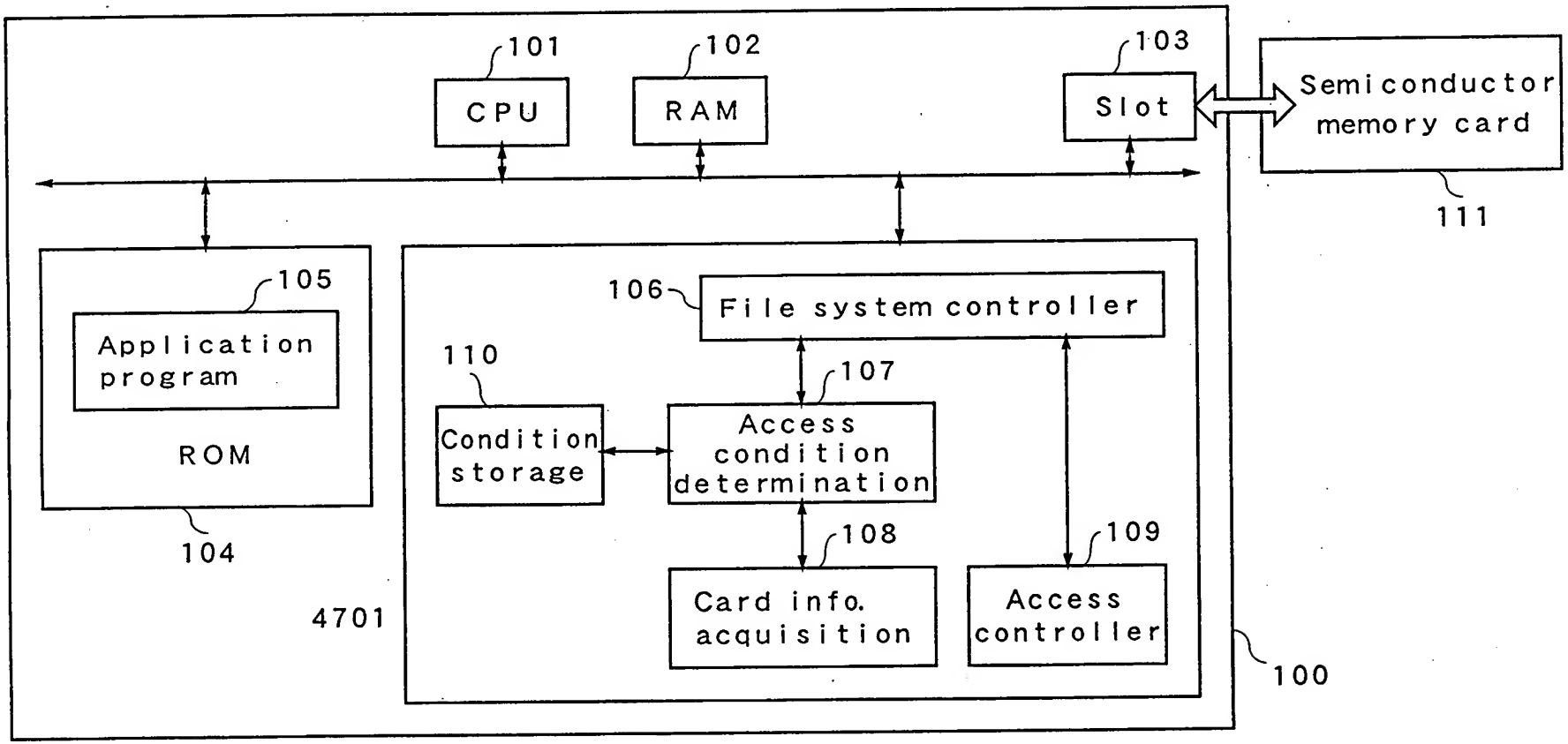
49

FIG. 47


101
CPU
102
RAM
103
Slot
Semiconductor memory card
111
105
Application program
ROM
104
106
File system controller
110
107
Condition storage
Access condition determination
108
109
Card info. acquisition
Access controller
4701
100